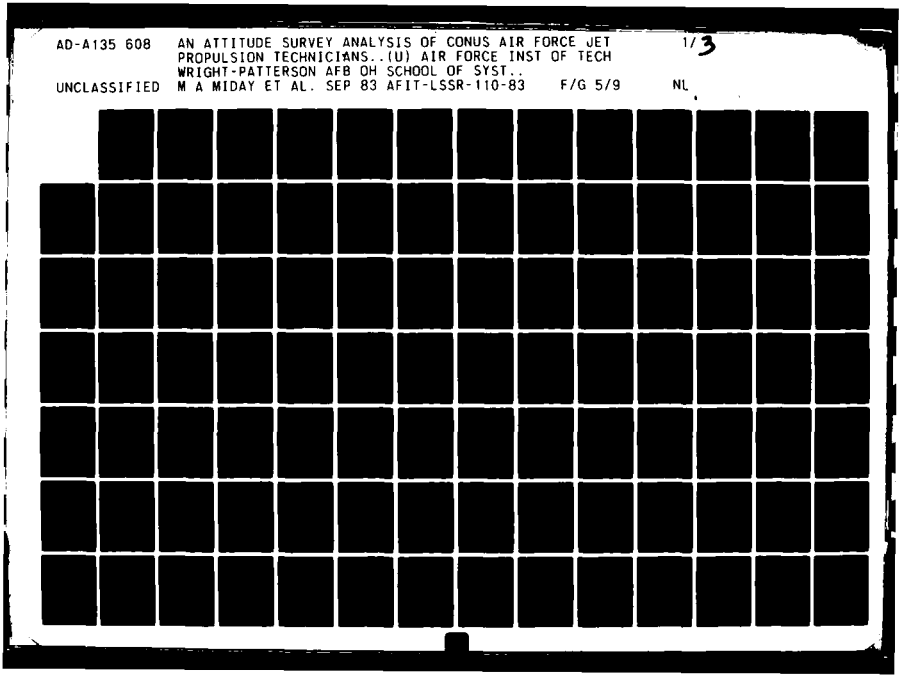
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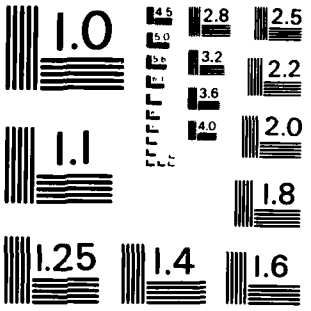

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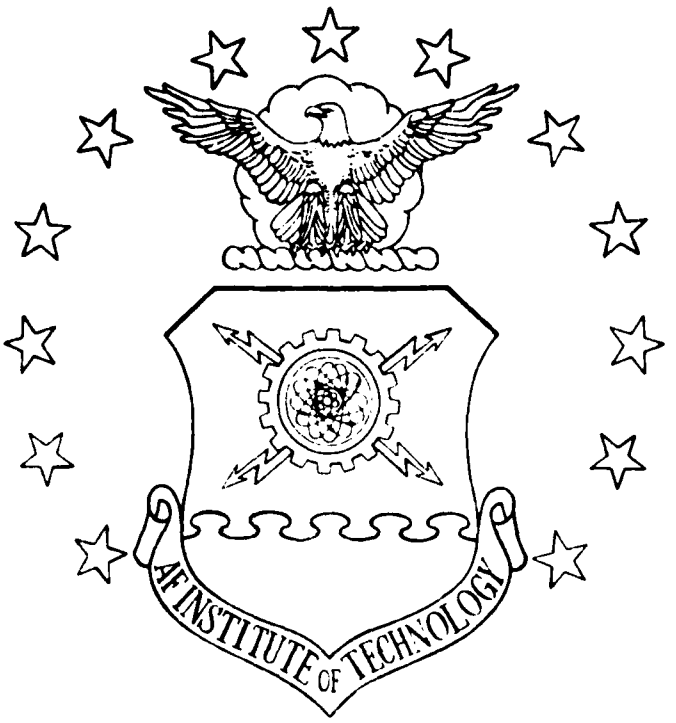

AN ATTITUDE SURVEY ANALYSIS OF CONUS AIR FORCE JET PROPULSION TECHNICIANS TOWARDS THE WARRANTED TOOL PROGRAM

Marilyn A. Miday, Captain, USAF
James D. Worthy, GS-12

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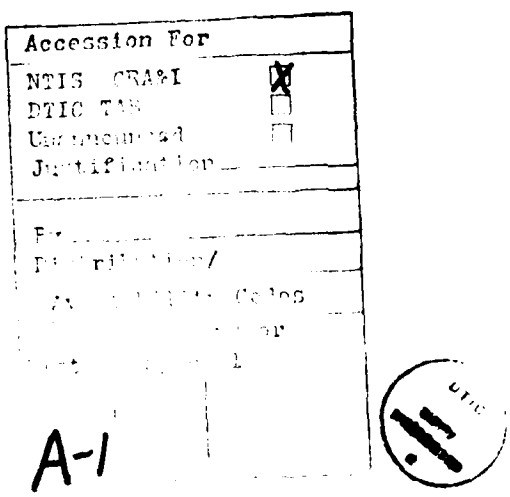

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Recently more emphasis has been placed on using life-cycle costs, availability, and reliability concepts for procuring items. One set of such items, identified by Headquarters Strategic Air Command as needing incorporation of these concepts, is the hand tools used by aircraft technicians. Air Force Logistics Management Center (AFLMC) project number 780205 tested the use of long-term warranted nonpowered, nonedged hand tools, Federal Stock Class 5120, in CONUS Air Force jet propulsion shops. Part of the evaluation of this Warranted Tool Program (WTP) involved analyzing the technicians' attitudes toward the quality of the tools provided. This thesis analyzes those attitudes by evaluating the collected data from the AFLMC questionnaire and this research team's telephone interviews. The statistical methods employed were the Paired-T Test, Analysis of Variance (ANOVA), Cross-tabulation, and Frequency. The results indicated overall approval of the WTP. A significant difference in attitudes of technicians based on Major Command and whether the base was north or south of 38° North latitude were noted. Senior technicians also expressed attitudes significantly different from the lesser experienced workers. A brief background of the hand tool quality problem, the results of the analysis, and recommendations are presented.

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AN ATTITUDE SURVEY ANALYSIS OF CONUS AIR FORCE JET PROPULSION TECHNICIANS TOWARDS THE WARRANTED TOOL PROGRAM

A Thesis

Presented to the Faculty of the School of Systems and Logistics

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In Partial Fulfillment of the Requirements for the

Degree of Master of Science in Logistics Management

By

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This thesis, written by

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CHAPTER I

INTRODUCTION

The Department of Defense (DOD) complex continuously seeks to achieve fiscal responsibility for every purchase made. Each service, down to its smallest component, scrutinizes all areas of their budget to encourage cost-effective buys. Under today's austere budgeting, all organizations must cut costs in every way possible. Today, nearly 80 percent of the total life-cycle cost of an Air Force weapon system results from the maintenance and operational support cost. A large proportion of the maintenance budget is expended on hand tools which, to date, have not shown the desired reliability. The tools appear to be of poor quality and design which, in turn, contributes to premature tool failure, equipment damage and, at times, injury to maintenance personnel. According to Hauck and Herndon, two major factors have contributed to this problem:

1. The General Services Administration's (GSA) Quality Deficiency Reporting System for hand tools has been ineffective.

2. Federal hand tool specifications designed to control the quality of hand tools are voluminous, costly to administer and, in some cases, outdated (6:12).

This problem of hand tool deficiencies in Air Force maintenance organizations has existed for more than twenty years. Then, in 1978, the Strategic Air Command (SAC) requested an investigation into hand tool quality after technicians throughout the command complained of breakage and tool failure. With the current trend of putting more emphasis on total cost and reliability concepts, new views of tool specifications and warranties have developed.

Definitions

Tool Specifications

The DOD refers to a specification as ". . . a document intended primarily for use in procurement [11:9]," indicating DOD's emphasis on the buyers' needs. On the other hand, the National Bureau of Standards views its use in procurement or manufacturing with the buyer and seller considered. The following review of a specification development for Government procurement shows the impact of the difference. A specification aims to adequately state the requirements defined by the ". . . characteristics which the item must possess to meet the needs of the purchaser [11:10]." Examples include size, weight, length, specific type (such as standard, six-inch, woodhandle screwdriver). Reliability, maintainability, and availability requirements are also stated.

A significant problem encountered is the large amount of specifications in the system. For example, in Federal Stock Class (FSC) 5120, nonpowered, nonedged hand tools, there are 315 specifications supporting 55,072 National Stock Numbers (NSN), indicating that the system is in need of overhaul (6:16). In addition, the complexity of the specifications has resulted in difficulty in finding manufacturers willing to bid on items of this nature or in bids that are within acceptable cost parameters (11:13). For example, Federal Specification GGGW 1437 (Appendix B) calls for stronger forging practices for wrenches than commercial manufacturers are currently using. If a manufacturer followed the above specification, it would result in a special production run to satisfy one customer, the Federal Government, who may or may not be a customer the following year (7). Keep in mind that the Government accounts for only 2 percent of commercial tool companies' business (22:22). If a company has to retool just to meet Government specifications, it incurs higher costs. Compound this with the fact that Government contracts are typically short-term and one sees that it can be a prohibitive proposition for business. Because the DOD has viewed specifications only from the purchaser's vantage point, it has incurred increased difficulty in acquiring the best, cost-effective buys.

In a move away from the ". . . outdated and inappropriate Federal specifications . . . [6:i]," the GSA Tools Commodity Center (the central procurement agency for all DOD hand tools) is developing Commercial Item Descriptors (CIDs) or using ". . . typical commercial specifications for off-the-shelf tool items [6:ii]." One such attempt is the use of Aerospace Standard (AS) 954A covering sockets, box end wrenches, and similar tools (Appendix B), which is geared toward improving Federal Specification GGGW 1437 (7). While this ensures more competition and thereby lower costs for hand tools, there is still no guarantee the tools will meet the needs of the users (6:26). Could warranties be the answer?

Warranties

A warranty is a ". . . contractual obligation that provides for a contractor to satisfy a system's field operational objectives [1:3-21]." While the warranty obligates the contractor, it also specifies the limitations of the contractor's liability. In essence, the warranty specifies what the contractor is and is not liable for. A warranty need not be spelled out in the contract (21:6). The Defense Acquisition Regulation (DAR) states that

> . . . a warranty is a promise or affirmation given by a seller to a purchaser regarding the nature, usefulness, or condition of the supplies or performance of services to be furnished [20:55].

The former takes the seller into consideration by including the concept of incentives. The buyer's view comprises the entire DAR definition. The importance of this distinction will be seen when the advantages of warranties are discussed later.

The Uniform Commercial Code further delineates warranty into types: implied and expressed. Implied warranty encompasses "merchantability" and "fitness for purpose" of the item sold. The first states the item ". . . shall be of the general kind described . . . [5:3]," and the latter covers items that ". . . shall be reasonably fitted for the purpose [5:3]." Expressed warranty refers to a ". . . promise made by the seller to the buyer and relating to the goods [5:3]." Two evident distinctions of expressed warranty involve commercial warranty and DOD expressed warranty. Commercial warranty refers to "warranties with a purchaser other than the Government." Warranties considered as DOD expressed comply with DARs (5:3). Lifetime warranties fit into the expressed commercial category. Captain Jack L. Grubb's master's thesis points out industrial warranty as another type, defined as ". . . an obligation of the seller to the buyer with respect to title, quality, state of past or future performability of goods sold or to be sold [5:1]." With the buyer and the seller working with different ideas of what a warranty is, there is bound to be confusion and misunderstandings.

Advantages of Warranties. The reason any consumer would desire a warranty is evident; in general, a warranty guarantees that the item purchased will work as promised. A warranty offers a guarantee that the seller will stand behind the product and will assume at least part of the risk should the product fail to perform as stated. The risk, of course, is generally limited to the loss of the investment in the product. Another important reason a warranty is desirable is that it provides an added incentive for the manufacturer to increase the quality and, therefore, the reliability of his products. It also gives the buyer time to uncover latent defects. The Government enjoys two other advantages. One relates to the sovereignty of the Government, implying that the Government sets the conditions for doing business. The other involves the Government's right to inspect and still be covered by the warranty should the item break after acceptance, even if the defect could not be discovered during reasonable inspection (5:12). Note that there are responsibilities the user must fulfill as well as the seller.

Disadvantages of Warranties. Past problems in warranty management include lack of knowledge by those responsible for implementing procedures, vague guidance, lack of compliance with established procedures, and a perception that warranties are not worth the time, effort, and

expense (3:5). These problems, identified over the past ten years by various researchers and investigative agencies, are still prevalent today (19:1-17). Current DARs require a contracting officer to price every aspect of a procurement (16). Because the supplier may incur costs under a warranty at a later date that are beyond manufacturing and distribution costs, these costs are incorporated into the initial cost of the item (10:2).

The problem is not only one of a higher initial cost but, also, of the difficulty in determining what that cost should be.

> In the majority of cases, Government procurement officers cannot determine how much a warranty is costing, because most manufacturers consider warranty costs to be proprietary information and will not divulge it [8:14].

Because it is "impossible to accurately evaluate the risks to the contractors," one study suggests that products not "pushing the state-of-the-art are unsuited" for warranties based on long-term reliability (15:22). Another negative aspect looks at transition costs for switching to and tracking of warranted items (8:16). Coupled with that is the prospect of increased paperwork necessary for item management (8:16). One study contends that the extra administrative work required of the owning unit has caused the traditionally poor reception within the military units (8:16).

The impact of the disadvantages depends on the management of the program. By considering the total cost and reliability concepts during the formulation of specifications, warranties, and, finally, the purchase contract, the concerns over cost elements may be lessened. While some additional paperwork will be required, it is believed that, in the Air Force, warranted items will be accepted (11:20).

Attitudes of Maintenance Personnel

An attitude is defined as ". . . an organismic state of readiness to respond in a characteristic way to a stimulus [17:73]." Whether our reaction is positive or negative depends on how we perceive the stimulus. A description of past attitudes of personnel toward their tools would have to include frustration and dissatisfaction, indicating an overall negative attitude. Most mechanics take as much pride in their hand tools as they do in their work. In this case, the higher quality hand tools would be the stimulus. The quality tools would cause the maintenance personnel to have a more positive outlook toward their work, resulting in increased morale and higher quality maintenance. One SAC Chief Master Sergeant, Charles L. Reynolds, contends that the Warranted Tool Program will have a ". . . positive influence on morale and attitudes of our maintenance personnel [12:14]." The chief also referenced "knuckle busters," injury to fingers and knuckles from tools slipping

when pressure is applied, as a common source of past frustrations. The poor quality of the hand tools and their subsequent failure under use were the culprits (12:14). Mr. John Tirpack, the Propulsion Branch Chief of the Productivity, Reliability, and Maintainability (PRAM) office at Wright-Patterson Air Force Base, found that the mechanics in the field, concerned over the quality of their tools and atuned to the ever-present cost considerations, experienced a feeling of going "up against a stonewall" when seeking hand tool improvements. The blame was placed on "the system [14]."

Brigadier General Gordon P. Masterson, Headquarters USAF/LEY (Supply and Maintenance) attributed the formation of the attitudes to the procurement policy of ". . . buying tools with what money was left . . . [9]" and failure to take advantage of commercial warranties. This caused concern on the part of the technician because he or she could have tools ranging from good to unsatisfactory. It appeared that tool selection was random and, as a result, each tool became an unknown in the performance of tasks. According to General Masterson, this in essence said to the technician, ". . . we set high quality standards, but provide you with junk tools [9]."

Problem Statement

In 1978, the Director of Aircraft Maintenance, Strategic Air Command (SAC), identified hand tool quality as a problem ". . . has caused considerable concern throughout our command [11:4]." A survey conducted by the Air Force Logistics Management Center (AFLMC) confirmed that the problem also exists in the other commands, the Air National Guard, the Air Force Reserve, and even the Army and Navy (11:4). After conducting a study of procurement procedures, field tool management, and the material deficiency reporting system, the AFLMC established a test program involving CONUS Air Force jet engine shops. These shops will use the newly procured, long-term warranted hand tools. The main thrust of this thesis centers on an analysis of the attitude survey distributed to Air Force jet propulsion technicians in the United States to determine the acceptance of the lifetime warranted hand tools program.

Background

AFLMC started the requested investigation into poor hand tool quality by studying the contributing factors of the problem: the Federal specifications, GSA hand tool quality, the Quality Deficiency Reporting (QDR) system, and the Consolidated Tool Kit program. As noted earlier, the effect of numerous, detailed and often outdated Federal specifications used by GSA resulted in a reluctance of

manufacturers to ". . . produce products within acceptable cost constraints [6:26]." Attempts to correct the problem include reviewing the specifications and incorporating commercial "off-the-shelf" hand tools and using CIDs (6:ii). However, AFLMC found the items obtained by GSA ". . . do not always meet user needs [6:26]." Nor do they include life-time warranted tools (6:i). Throughout this thesis, the term, GSA supplied tools, refers to tools procured under this policy.

Quality Deficiency Reporting (QDR)

The procedures for reporting defective tools is established in Air Force Regulation (AFR) 74-6 and Technical Order (TO) 00-35D-54. An examination of the QDR system brought out several areas of weakness. Ideally, when a technician has discovered a defective tool, a Standard Form (SF) 368 is filed in accordance with TO 00-35D-54. Next, the SF 368 is forwarded for review to the Air Force Item Manager (IM), who then sends it to GSA. Then, the Air Force IM must provide an answer to the sender within sixty days (13). GSA conducts laboratory testing on the same type tool from the same lot buy. Only after a deficiency is confirmed is any corrective action taken to include reimbursement to the using organization submitting the SF 368 (6:8). It was discovered that 80 percent of the forms never went beyond the Air Force IM because of administrative errors (6:11). Failure

to include required information such as contract, purchase order, or document numbers led to the automatic closing of the investigation. Those required numbers are not available to the maintenance technician or the base supply personnel (6:11). In addition, the GSA allows reimbursements only for those items priced at twenty-five dollars or more; only 13 percent of the reported defective hand tools fell in this category (6:9,12). The time span between the turn-in of a broken tool and the reimbursement to the unit has an effect on motivation for compliance of deficiency reporting, particularly when the technician does not see the pay-back (8:16). Because of these weaknesses in the QDR system, most maintenance personnel do not feel it is worth the "hassle" to file an SF 368 (8:19).

Composite Tool Kit (CTK)

The management of tools in operational units is under the relatively new Consolidated Tool Kit (CTK) program. Prior to CTK, hand tools were issued to maintenance personnel upon arrival to the unit and returned at the individual's end of tour. Each individual had the responsibility of maintaining the same number and type of tools as received throughout the tour. Should one of the tools break, the technician would turn in that one and receive a new one from the tool crib; records of replacement or breakage were kept. Worse yet was the practice by some, according to Major Reyer's research

(11:1), of "scrounging" from another worker's tool box. As a consequence, control and accounting procedures were practically nonexistent, causing ever-climbing tool costs.

In 1971, the United States Air Force implemented the CTK concept originated by the United Kingdom's Royal Air Force. The four basic concepts forming the core of the program are:

1. Tools for several technicians are consolidated into a single tool kit.

2. Tools are arranged in an orderly manner with a specific location for each tool, either on a shadow board or in a box, with inlays of plastic or foam.

3. Tools are inventoried frequently to maintain accountability, which reduces the incidence of foreign object damage (FOD).

4. Functional area managers assume a large share of the responsibility of tool control (15:22).

Captain Hauck reports ". . . by 1976, CTKs were widely used in aircraft maintenance and reports of cost savings into the hundreds of thousands of dollars have been common [4:21]." In surveys conducted in 1973 and 1975, the attitude of the maintenance personnel swung from 69 percent preferring individual tool boxes to 62 percent favoring the CTKs (6:3).

Maintenance organizations soon realized the benefits of the program. A reduced inventory created more space,

lessened the weight of some kits, and simplified control procedures; accountability improved. This program, however, highlighted another problem. Because each tool was being used more often, tool failures increased. Due to increased supervisory involvement and improved inventory practices, this problem received proper attention. SAC, in particular, felt the impact as evidenced by the following partial quote from the Director of Maintenance's letter to AFLMC:

> The quality of hand tools being procured for Air Force use has caused considerable concern throughout our command--especially at the level of the user where specific tech order torque/stress requirements exist for the application and removal of component parts, instruments, etc. Too frequently there is a great deal of breakage or tool failure indicating either the tool did not meet the required tool specifications, or the tool specifications did not meet the job requirements. In the past, we have bought quantity at the cheapest cost. Now, with improved tool control, reduced tool authorizations, and increased utilization of each tool possessed as a result of the Consolidated Tool Kit Program, we urge a comprehensive evaluation of the cost impact of purchasing quality tools versus the economy of purchasing low bid contract tools [11:4].

Economic Analysis

The AFLMC study found that the specifications and QDR system were both ineffective for hand tool assurance. It also verified the problem existed Air Force-wide. To provide accurate data for the next step, economic analysis, actual hand tool failure data was collected from twenty-five stateside Air Force jet engine shops. Captain Wheeler (20:23)

cited the workload and "crucial application placed on hand tools" as reasons for choosing the jet propulsion shop. Other reasons listed in the January 17, 1983 issue of the Air Force Times (4:6) pointed to the requirements for tools that ". . . can deal with high torques, tight accesses, high heat and corrosion [4:6]."

In eight months of data collection, 5,010 hand tools failed. Of these, just fifty-four types of hand tools were responsible for 42 percent of the failure (20:3). Because the main disadvantage to long-term warranted tools is the high initial investment cost, an economic life-cycle cost analysis to determine pay-back periods of the collected data was performed. The comparison between 186 SNAP-ON tools and similar GSA tools indicated thirty-five of the SNAP-ON tools had five years or less pay-back periods (20:24). An estimated $2 million per year, after pay-back, could be saved, compared to the current replacement cost of $8.2 million per year for the Air Force (6:40).

The Warranted Tool Program (WTP)

Recommendations were made to replace selected GSA tools with lifetime warranted hand tools (20:24). In coordination with HQ USAF/LEY (Maintenance and Supply) and GSA, AFLMC developed a test program. Guidelines stipulated that no more than one hundred hand tool types would be involved and, because of cost, only one Air Force shop specialty in the United States was eligible (20:24). Next,

solicitation for warranted tools without the typical hassles of Federal specifications, metallurgical testing, and sampling was put before the tool industry. A guarantee to purchase a minimum quantity of each item was proposed by the Air Force. An additional enticement of an incentive for longer warranty periods was offered, implying that longer warranties mean better quality (20:24). Of the five responding companies, GSA made final negotiations with two--SNAP-ON Tool Corporation and Fraunholtz Tool Company (20:24).

The SNAP-ON Tool Corporation offers an indefinite commercial warranty for its top-of-the-line hand tools with on-base exchange procedures. However, not all locations will have a representative on base; some will exchange during the representatives' periodic visits. In case of an emergency, the representative will respond at the customer's request (21). Repair or replacement of a tool by SNAP-ON will occur at the company's expense after it has been inspected (20:24).

Fraunholtz guarantees the other twelve hand tools for a period of fifteen years. The top-of-the-line, high-quality tools include needle nose pliers and diagonal cutting pliers manufactured by Diamond Tool Company and #4 Phillips screwdrivers manufactured by Stanley Tool Company (18:1). The remaining nine, ranked as economy grade fourth-from-the-top screwdrivers, are also made by Stanley. The quality of the

latter tools is still thought to be better than similar GSA tools, but will be monitored closely (18:2). Tool replacement will be via mail with the Air Force paying shipping costs for broken tools to Fraunholtz, and the commercial company paying the bill for the replacement postage (18:2).

During the next phase of the program, which the Air Force Times (4:6) quotes as being the "evaluation stage," the data from the participating bases will be gathered, compared, and analyzed.

The one aspect not addressed in the data researched is information on the attitudes that maintenance personnel might have toward tools. This attitude, positive or negative, could affect their performance. Because of the possible impact on performance and effectiveness, a survey has been sent to 623 individuals at the bases participating in the Warranted Tool Program (WTP) to measure any changes in their attitudes. This thesis is an analysis of the maintenance technicians' perceptions.

Justification

Once SAC had identified a problem with hand tool quality, AFLMC distributed a survey requesting maintenance technicians to voice their concerns about tool quality. A few of the concerns listed were overall poor tool quality, personnel injury, foreign object damage, tool replacement costs and, finally, frustration (6:37). Under the WTP, it

is assumed that many of the aspects leading to frustration are lessened or eliminated. However, no measure of the attitude difference currently exist; AFLMC has requested some measurement be taken (21). An attitude survey was developed and issued to sixteen bases by AFLMC. However, this thesis team felt that the survey failed to address the maintenance technicians' concerns and did not incorporate correct sampling techniques to insure random sampling; another measure was developed. This instrument, a telephone survey, consisted of questions incorporating the expressed concerns of the technicians. The analysis of both surveys will be addressed in Chapter III.

Scope

Our intent is to expand the understanding of the attitudes of tool users towards the quality of their tools. The investigation of what effects, if any, experience, geographic location, and major command have on the attitudes encompasses another part of the task. A total of 623 surveys, compiled by AFLMC, were sent to jet engine shops at sixteen bases in the United States (22:Atch 1). The personal telephone interviews covered three experience ranges from twenty-five CONUS Air Force bases. In all, four major commands--Strategic Air Command (SAC), Military Airlift Command (MAC), Tactical Air Command (TAC), Air Defense Tactical Air Command

(ADTAC), plus Air National Guard (ANG), and the Air Force Reserve (AFRES).

Objectives, Questions, and Hypotheses

The following is a list of research objectives (O), questions (Q), and hypotheses (H) used for the AFLMC survey:

1 O: Determine if there is a difference in perceived quality of tools supplied by SNAP-ON and those supplied by GSA.

1 Q: Do technicians perceive a difference in tool quality of GSA tools and SNAP-ON warranted tools?

1 H: There is no difference in perceived quality of GSA supplied tools and SNAP-ON warranted tools.

2 O: Determine statistically whether years of experience has an affect on quality perception.

2 Q: Does the number of years experience make a difference in quality perception?

2 H: There is no difference between years of experience in how quality is perceived.

3 O: Determine statistically whether assigned major command affects perception of tool quality.

3 Q: Does the assigned major command affect how tool quality is perceived?

3 H: There is no difference as to how quality is perceived based on major command.

4 O: Determine statistically whether personnel stationed north and south of 38° N latitude exhibit differences in attitudes pertaining to hand tool quality.

4 Q: Is there a difference in attitudes pertaining to tool quality based on whether technicians are stationed north or south of 38° N latitude?

4 H: There is no difference in attitudes toward hand tool quality between personnel stationed north and south of 38° latitude.

5 O: Determine statistically whether the Diamond Tool Company (DTC) needle nose pliers are perceived to be of better quality than those supplied by GSA.

5 Q: Do technicians feel that DTC needle nose pliers are of better quality than GSA pliers?

5 H: There is no difference in attitudes toward needle nose pliers supplied by DTC as compared to those supplied by GSA.

6 O: Determine if technicians feel that there is is a difference in quality of the diagonal cutting pliers from DTC as compared to those supplied by GSA.

6 Q: Is there a difference in attitude towards diagonal cutting pliers from the DTC and GSA?

6 H: There is no difference in attitude towards diagonal cutting pliers from DTC as compared to those from GSA.

7 O: Determine statistically if technicians perceive a difference in quality between Stanley and GSA screwdrivers.

7 Q: Do technicians' opinions of Stanley versus GSA screwdriver quality differ?

7 H: There is no difference in screwdriver quality between GSA and Stanley in the opinion of the technicians.

8 O: Determine if technicians feel that warranted tools have reduced their frustrations.

8 Q: Is there a difference in frustration felt with GSA tools and with warranted tools?

8 H: There is no difference in the frustration felt based on which tools are used.

The following is a list of research objectives (O), questions (Q), and hypothesis (H) for the telephone interviews:

9 O: Determine whether the mechanics know which tools are under the WTP.

9 Q: Do mechanics know which tools are in the WTP?

9 H: The mechanics do not know which tools are in the WTP.

10 O: Determine whether technicians detect a difference between GSA and WTP tool performance.

10 Q: Do the technicians feel there is a difference between GSA and WTP tool performance?

10 H: Technicians do not detect a difference in tool performance between GSA and WTP tools.

11 O: Determine if the technicians preferred the WTP broken tool exchange program.

11 Q: Do technicians prefer the WTP broken tool exchange program?

11 H: Technicians show no preference for the WTP broken tool exchange program.

12 O: Determine whether technicians are dissatisfied with the Quality Deficiency Reporting (QDR) system for broken tools.

12 Q: Are technicians dissatisfied with the QDR system for broken tools?

12 H: The technicians are satisfied with the QDR system for broken tools.

13 O: Determine whether mechanics feel there has been an improvement in the areas of safety, FOD, production, and equipment damage due to the WTP.

13 Q: Do mechanics feel there has been improvements in the areas of safety, FOD, production, and equipment damage due to the WTP?

13 H: Mechanics do not feel there has been improvement in the areas of safety, FOD, production, and equipment damage.

14 O: Determine the technicians' overall opinion of the WTP.

14 Q: What is the technicians' overall opinion of the WTP?

14 H: The technicians' overall opinion of the WTP is unfavorable.

CHAPTER II

METHODOLOGY

Introduction

In an effort to determine attitudes of jet propulsion mechanics toward tools purchased using GSA specifications and tools provided under the WTP, AFLMC distributed over 600 sixteen-question surveys to sixteen bases in five major commands. The analysis of the survey results will provide the core for this thesis. In addition, the authors conducted personal telephone interviews as a means of gathering more information on the topic. This chapter describes the universe, population, method of sampling, instruments, and statistical techniques of analysis for relating the survey statistical results to the research hypotheses. While the universe and population were identical for both instruments, the AFLMC survey and our telephone interviews have different samples, techniques, and criteria tests and will be covered separately under each heading. Finally, a section on assumptions and limitations is presented.

Universe

The universe for both instruments consists of all U.S. Air Force, Air Force Reserve (AFRES), and Air National Guard (ANG) aircraft maintenance shops.

Population

The population of interest consists of all continental U.S. (CONUS) Air Force, AFRES, and ANG jet propulsion shop technicians. The population for both instruments was jointly established by AFLMC and GSA. The GSA requested the test program be limited to one-hundred items, one Air Force shop, and only CONUS bases in order to restrict budget expenditures. The AFLMC selected the jet propulsion shop because of that shop's past high breakage rate of hand tools, their workload, and critical applications. The ninety-five hand tool line items were selected based on a life-cycle cost analysis. The limitation to CONUS bases resulted in 155 bases being eligible for consideration (Appendix C).

Sampling Methods

AFLMC Survey

The sponsor, AFLMC, requested from five major commands, AFRES, and ANG a list of bases they wished to have participate in the survey. Sixteen bases were nominated (Appendix D). Each base jet propulsion shop was contacted to determine the number of assigned personnel. Sufficient surveys were distributed for all shop personnel to participate, 623 surveys in all. The final sample consisted of 523 returned surveys for a valid response rate of 84 percent. Table 1 provides the reader with a detailed breakdown by sample category. The number and diversity of the total sample is sufficient to provide

TABLE 1

WARRANTED TOOL USER SURVEY RESPONSES

Total Surveys Mailed	623									
Total Surveys Returned	525 (84.3% response rate)									
Total Usable Surveys	523 (84% response rate)									
COMMAND	SAC	MAC	TAC	ANG	AFRES	ADTAC				
Total (usable)	174	199	123	14	2	11				
RANK OF RESPONDENT	E1	E2	E3	E4	E5	E6	E7	E8	E9	Civ
Total (usable)	5	24	181	118	113	36	13	3	1	29
YEARS EXPERIENCE (in months)	0-24	24-84	84-144	145+						
Total (usable)	182	204	59	78						
GEOGRAPHICAL LOCATION (38° Latitude North)	North	South								
Total (usable)	165	358								

for adequate representation allowing for population inferences.

The 523 usable surveys were categorized by major command, rank, years of experience, and geographical location to determine whether those factors affected personnel attitudes towards hand tools. The purpose of the breakdown by command was an attempt to see if the different regulations and mission requirements influenced responses. For this reason, the AFRES and ANG were included as commands in the

survey. The Years of Experience grouping consolidates the ranks for easier statistical manipulation and a truer picture of personal opinion due to job background. The divisions follow the transition periods of apprentice (0-24 months), journeyman (24-84 months), supervisor (84-144 months), and manager (144 plus months). The use of years of experience also adjusts for cross-trainees, demotions, and delayed promotions not accounted for under Rank. The Rank category was not used in the statistical analysis and was included only to show the breakout. It should be noted that those respondents listed as Air Reserve Technicians (ARTs) were included under the civilian section because the majority of their work is in civilian status, as opposed to active military duty. The Geographical Location listing was designed to determine whether northern-based respondents would differ in attitudes from southern-based respondents. The dividing line was arbitrarily picked to be the 38 degrees north latitude, since this provides a clear division for the fifteen responding bases. Appendix F shows the north/south listing.

Telephone Interview

The thesis team originally planned to perform on-site observations and personal interviews to supplement the AFLMC survey findings. Time and budget constraints, however, precluded these actions. Therefore, telephone interviews were

conducted in lieu of on-site observations. A sample of twenty-five bases out of the population of 155 was decided upon. At each base, three jet propulsion mechanics, one with more than two but less than five years experience, a second with more than five but less than ten years experience, and a third with more than ten years experience, were questioned for comparison of attitudes based on their experience.

The base selection process consisted of first assigning a number from 1 to 155 to the participating bases as listed in the AFLMC Report (Appendix C). Then a random number generation was used to produce a list of 25 numbers in the range from 1 to 155. The bases with the corresponding numbers were then used in the telephone survey (Appendix E). Each Propulsion Branch Chief at these bases was requested to supply a technician for each experience category, thus providing a total sample of 75.

Instruments

AFLMC Survey

The AFLMC constructed their instrument based on the research study of an Air Command and Staff College student. The survey (Appendix G) is in three parts. The first consists of four demographic questions determining major command, rank, years of experience, and whether warranted tools are

used. Then questions five through sixteen ask for attitudinal responses using a six-point Likert Rating Scale. The respondent selects one of the six responses for each attitude item--very poor, marginal, acceptable, good, excellent, or not applicable or no opinion for questions five through twelve. For questions thirteen through sixteen, strongly disagree, disagree, undecided, agree, strongly agree, or not applicable or no opinion were used. The final section asks for comments from the respondent.

By making the assumption that the distance between each point on the Likert scale is equal, a technique incorporating interval level data can be used. Research indicates that this relatively simple method of weight assignment allows for a .99 correlation as compared to the normal method with less manipulation (2:151). In addition, the reliability is increased when this is used on surveys with ten to eighteen questions (2:161).

Telephone Interview

The instrument used for the telephone interview was developed by the authors of this thesis. The interview guide consists of two sections, one covering demographic information, the other has ten questions designed to solicit the respondents overall attitude toward the warranted tools and the WTP as opposed to the tools provided by GSA prior to

the program. The formation of the questions was based on the nine categories of concern developed from the AFLMC 1978 inquiry listed below (6:37):

1. Tool quality
2. Tool standardization
3. Foreign Object Damage (FOD)
4. Injuries
5. Equipment damage
6. Replacement costs
7. Time lost on the job
8. Frustration
9. Substitution

Additional questions focus on the QDR system and the ability of the technician to detect which tools are under warranty. An example of the telephone interview guide is in Appendix H.

Instructions to Branch Chief. To provide as much consistency in survey administration as possible, a set of instructions for conducting the interview was given to the branch chief. With the objective of precluding collaboration and intimidation of the interviewee, a request was made to interview each person in an environment completely removed from outside influences. Each branch chief was requested to supply the interviewer with the number of assigned personnel and one person from each of the following maintenance experience categories:

1. Over 2 but under 5 years
2. Over 5 but under 10 years
3. Over 10 years

Instructions to Subjects. The subjects were informed that the purpose of the interview was to provide information for a master's thesis at the Air Force Institute of Technology, Wright-Patterson Air Force Base. At the same time, they were assured of their anonymity.

Statistical Techniques

The following discussion covers the statistical techniques utilized for the data analysis. The section starts with an explanation of the preparation of the data obtained from the AFLMC survey. This is followed by the different statistical methods used on the data to test the hypotheses for the survey. Finally, there is a brief discourse on the technique for analyzing the telephone interviews.

Data Preparation

Of the 525 surveys received, two were discarded because of insufficient demographic data. In addition, there were six jet propulsion shops not using the Fraunholtz supplied tools, the Stanley screwdrivers and DTC pliers. These 278 surveys were not used for hypotheses 5, 6, and 7. The bases affected are listed below:

Seymour-Johnson AFB NC

Charleston AFB SC

Minot AFB ND

Robins AFB GA

Ellsworth AFB SD

Norton AFB CA

Appendix J contains the 523 usable data points.

For analysis purposes, a numerical value ranging from zero to five was assigned to the responses for each attitude item or question. The assignment of a specific numerical value depended on the wording of the response. The responses labeled "Not Applicable or No Opinion" were coded zero. The weights for the remaining responses correspond to the number over them, i.e., "Very Poor" and "Strongly Disagree" are weighted one, while "Excellent" and "Strongly Agree" are valued at five. Thus, the score for an item indicates the degree of positive or negative attitude towards that item.

Statistical Methods

A variety of statistical methods were employed to test the hypotheses dealing with the AFLMC questionnaire. Each method utilized the Statistical Package for the Social Sciences. The Paired-T test was used for testing hypotheses 1, 5, 6, and 7. Hypotheses 2, 3, and 4 were tested using One-Way Analyses of Variance (ANOVA). Crosstabs were also

run for hypotheses 2, 3, and 4. In addition, frequency bar charts for attitude items 5-16 were developed. Table 2 shows the hypothesis and attitude item matchings. The doubling of variables under 2H, 3H, and 4H indicate the survey questions analyzed under ANOVA followed by those evaluated by crosstabs.

TABLE 2

VARIABLE PAIRINGS AND HYPOTHESES
AFLMC SURVEY

Variable Pair	Hypothesis Number
Question 5 vs. 6	1 H
Questions 5, 6, 7, 8, 9, 10, 11, 12 vs. Years of Experience and 13, 14, 15, 16 vs. Years of Experience	2 H
Questions 5, 6, 7, 8, 9, 10, 11, 12, 13 vs. Major Command and 13, 14, 15, 16 vs. Major Command	3 H
Questions 5, 6, 7, 8, 9 10, 11, 12, 13 vs. Bases North/South and 13, 14, 15, 16 vs. Bases North/South	4 H
Question 7 vs. 8 needle nose pliers	5 H
Question 9 vs. 10 diagonal cutting pliers	6 H
Question 11 vs. 12 screwdrivers	7 H
Question 13 vs. 16 frustration	8 H

It is essential to the understanding of the analysis section to review some key points regarding statistical testing. For instance, the hypotheses listed on page 32 are the null hypotheses. The null hypothese (H_o) calls for a comparison of means and postulates there is no significant difference between the concerned groups. In testing the H_o, the decision rule is: Reject the H_o if the analysis shows that H_o cannot be supported. The error or rejecting the H_o, when in fact it is true, is expressed as a Type I error; and α is its level of significance. The reverse of this, accepting H_o when it is false, is known as a Type II error; and β expresses its level of significance. The risk of a Type II error depends on α and sample size. Because we are dealing with large sample sizes, the β risk is reduced. The final decision of whether the null hypothesis is rejected will depend on the significance level (α) chosen.

Paired T-Test. This is a test to determine if the difference between paired sample means is significant. The goal of the analysis is to determine if a difference between paired samples is significant. If the predetermined significance level is greater than the SPSS calculated 2-tail probability, the null hypotheses is rejected. The pairs tested were developed from the questions in the survey. Each question dealing with the GSA tools (the odd numbered

questions) was matched with the corresponding WTP tool question (even numbered) as indicated in Table 2. Thus, for hypothesis one, which states there is no difference in perceived quality of GSA tools and SNAP-ON warranted tools, the questions paired are 5 versus 6. Question 7 versus 8 was used to determine whether the Diamond Tool Company needle nose pliers were perceived to be better than those from GSA for hypothesis five. Hypothesis six paired question 9 versus 10. Hypothesis seven matched 11 versus 12. And, finally, hypothesis eight compared question 13 with 16. For the purpose of testing the null hypothesis (H_0), a predetermined significance level of .05 was used. The SPSS program appears in Appendix I.

Analysis of Variance, ANOVA. When a need exists to compare two or more populations to determine if they respond to an attitude item similarly, a comparison of the ratio of within group variance by between group variance to see if at least one group's mean is different than the others. The hypothesis tests are based on the ratio's of the mean squares of each of the sources of variation to the mean square for the residual. The F-probability is computed using a SPSS program listed in Appendix I. If the F-probability is greater than the predetermined F-value, then reject the null hypothesis that all samples responded in a similar manner.

Next, a determination is made as to which sample or samples responded differently from the others. The test used when sample sizes are unequal is the Modified Least Squares Difference test calculated by the SPSS program. In this test, a range for each sample's mean is calculated at the .05 significance level. A homogeneous subset is one whose highest and lowest means do not differ by more than the shortest significant range calculated for that subset. If any mean is significantly different from the others, it will not be included in that subset.

For hypotheses two through four, the questions evaluated paired 5 with 6, 7 with 8, 9 with 10, and 11 with 12. It was decided not to include questions 13 through 16 under ANOVA since it appeared that they may be measuring frustration with the Air Force and not the tools. By eliminating them from this analysis section, it was hoped a more accurate result would be obtained for attitudes about the tools. The hypothesis on frustration, eight, is evaluated using the Paired T-test and crosstabulation.

CROSSTABS. In evaluating whether years of experience, major command, and base geographic location affected the responses, another method used, other than ANOVA, is the crosstabulation technique. The SPSS command shortens the method name to CROSSTABS. CROSSTABS provides several indexes that measure the extent of variable association.

The choice of which indexes to use is dependent on the type of data, the hypothesis of interest, and the properties of the measures. As stated previously, the data being analyzed is on an interval scale. To determine whether the different categories under years of experience, major command, and base location are affecting the dependent variable, the responses, the eta coefficient is used. The properties of the eta coefficient include nonassumption of linearity relationship between the variables and is best for a dependent variable on an interval scale with the independent variables, the categories, on a nominal or ordinal scale. When the eta is squared, it can be interpreted as the proportion of the total variability in the dependent variable accounted for by knowing the values of the independent variables. The results of this analysis for all the questions applied to hypotheses two through four appear in the Data Analysis Chapter.

Frequencies. Frequency bar charts and tables for each question are included for clarification of response distribution. Since the Paired-T tests, ANOVA tests, and CROSSTABS provide a better, more powerful description of the population, the frequency results will not be analyzed.

Telephone Interviews

The analysis of the telephone interviews is based on a straight forward count of positive and negative remarks.

The significance of the data is based on the total number under each category. Table 3 provides the breakdown of which questions apply to which hypothesis.

TABLE 3

VARIABLE AND HYPOTHESES
TELEPHONE INTERVIEW

Variable	Hypothesis Number
Questions 1, 2	8 H
Questions 4, 5, 6	9 H
Questions 7b, 7c	10 H
Questions 7e, 7f	11 H
Question 8	12 H
Question 10	13 H

Assumptions and Limitations

Assumptions

1. The measurement of scale is interval.

2. The responses received are representative of the population.

3. There was no coercion or collaboration between participants.

4. The questions asked, measure attitudes toward hand tools and not the Air Force in general.

5. Respondents have used tools procured through both the old program and the WTP.

6. The participants are not biased concerning tool brand names, i.e., Craftsman, Utica, SNAP-ON.

Limitations

1. AFLMC study was limited to fifteen participating CONUS Air Force jet propulsion shops.

2. The telephone interviews were limited to twenty-five bases, three people at each base, in the interest of time and AUTOVON availability.

3. The portion of the study accomplished by telephone was done so due to personnel travel limitations and budget constraints.

CHAPTER III

DATA ANALYSIS

Introduction

The material presented in Chapter II provided the operational definitions and methodology used in the data analysis. This chapter covers the results of the data analysis in terms of the research objectives and hypotheses. The AFLMC survey is discussed first, followed by the telephone interview.

AFLMC Survey

Each research objective and hypothesis is restated below. Then a brief description of the statistical test used for analysis is given, followed by the analysis results. All hypothesis testing was based on the assumption that the samples were normally distributed, randomly obtained, and independent of each other. The Statistical Package for the Social Sciences (SPSS) provided the computer software program for all computations. The computer programs and computer products of the final results can be found in Appendix I.

Two main and most powerful tests were used: the Paired-T test and the One Way Analysis of Variance (ANOVA). Hypothesis one, five, six, seven, and eight were tested using

the Paired-T test because this method provides for the least variability of the T test statistic. The ANOVA is a statistical method that tests the hypothesis that several population means are equal. Since hypotheses two, three, and four involve the difference between two survey questions as related to multiple categories, such as the major commands, the ANOVA was used as the most appropriate technique. To further identify the responses under each category, a CROSS-TABS procedure was run, the results of which are discussed after the hypothesis testing. Also included is a section on the frequencies for each question. The last section contains some of the comments supplied by respondents.

Objective 1

Determine if there is a difference in perceived quality of tools supplied by SNAP-ON and those supplied by GSA.

Null Hypothesis. There is no difference in the perceived quality of GSA supplied tools and SNAP-ON warranted tools.

Test. The Paired-T test was used to compare AFLMC survey question five with question six.

Results. For this hypothesis there were 515 usable data points. The Paired-T test showed a mean difference of

-1.8291, a standard deviation of 1.408, a standard error of .062, and a 2-tail probability of .042. Since .042 is less than the predetermined significance level of .05, the null hypothesis is rejected. Therefore, there is a significant difference between the perceived quality of GSA tools and SNAP-ON tools.

Objective 2

Determine statistically whether years of experience has an affect on quality perception.

Null Hypothesis. There is no difference between years of experience in how quality is perceived.

Test. The ANOVA was used to test this hypothesis. The differences between AFLMC survey questions were computed as described in Table 4.

TABLE 4

ANOVA DIFFERENCE COMPUTATION

Difference		Questions
Diff 1	=	Q 6 - Q 5
Diff 2	=	Q 8 - Q 7
Diff 3	=	Q 10 - Q 9
Diff 4	=	Q 12 - Q 11

Each difference was compared to all four experience levels (see Table 5).

TABLE 5

EXPERIENCE

Experience Level	Experience in Months
1	1 thru 24
2	25 thru 84
3	85 thru 144
4	145 and up

The object was to determine if there is a statistical difference between each difference and any of the experience levels. That is, the ANOVA was used to compare Diff 1 through Diff 4 with experience level 1; then, Diff 1 through Diff 4 with experience level 2, and so on.

Results. Based on a significance level of .05, there was insufficient data to reject the null hypothesis in differences 1 through 3. The F-probability of difference 4, however, is significantly less than the predetermined level of .05. In this case, therefore, the null hypothesis is rejected. This indicates that for experience level 4 in Difference 4 there is a difference in how quality is perceived.

Objective 3

Determine statistically whether the assigned major command affects perception of tool quality.

Null Hypothesis. There is no difference as to how quality is perceived based on major command.

Test. The ANOVA was used to test this hypothesis. The same test format was followed as stated in Objective 2, except the computed differences in the AFLMC survey questions were compared to the variable major command (CMD), which is broken down into six segments as shown in Table 6.

TABLE 6

MAJOR COMMAND SEGMENTS

Code	Command
A	Strategic Air Command
B	Military Airlift Command
C	Tactical Air Command
D	Air National Guard
E	Air Force Reserve
F	Air Defense Tactical Air Command

Results. Based on the predetermined significance level of .05 in difference 1, there was no insufficient data to reject the null hypothesis. However, differences 2

through 4 had a F-probability less than .05. Therefore, there is sufficient data to reject the null hypotheses and conclude that there is a difference in how quality is perceived based on certain major commands. The major commands affected by the differences are listed in Table 7.

TABLE 7

AFFECTED COMMANDS

Difference	Major Command Affected
2	SAC, MAC, ANG, ADTAC
3	SAC, MAC, TAC, ANG, ADTAC
4	ADTAC

Objective 4

Determine statistically whether personnel stationed north and south of 38° north latitude exhibit differences in attitudes pertaining to hand tool quality.

Null Hypothesis. There is no difference in attitudes toward hand tool quality between personnel stationed north and south of 38° north latitude.

Test. The ANOVA was used and the differences in AFLMC survey questions computed as in objectives 2 and 3. The bases were grouped into two groups, group 1 represented the bases north of 38° north latitude and group 2 represented

those bases south of the 38° north latitude. Each difference, Diff 1, Diff 2, Diff 3, and Diff 4 was compared to group 1 and to group 2.

Results. Based on the predetermined significance level of .05, Diff 1 with a F-probability of .2766 indicated that there was not enough information available to reject the null hypothesis. However, Diff 2 through Diff 4 exhibited F-probabilities of .0001, .0145, and .0135 respectively. Since each is less than .05, the null hypothesis for these three cases can be rejected and it can be concluded that there is a significant difference in quality perception between personnel stationed at bases north and south of 38° north latitude.

Objective 5

Determine statistically whether the Diamond Tool Company (DTC) needle nose pliers are perceived to be of better quality than those supplied by GSA.

Null Hypothesis. There is no difference in attitude toward needle nose pliers supplied by DTC as compared to those supplied by GSA.

Test. The Paired-T test was used to compare AFLMC survey question seven with question eight.

Results. For this hypothesis there were 223 usable data points. The Paired-T test showed a mean difference of -.6726, a standard deviation of 1.691, a standard error of .113, and a 2-tail probability of .180. The 2-tail probability is larger than the predetermined significance level of .05. Therefore, there is not enough information to reject the null hypothesis or to say that there is a difference in attitude toward needle nose pliers supplied by DTC as compared to GSA.

Objective 6

Determine if technicians feel that there is a difference in the quality of the diagonal cutting pliers from DTC as compared to those supplied by GSA.

Null Hypothesis. There is no difference in attitudes towards diagonal cutting pliers from DTC as compared to those from GSA.

Test. The Paired-T test was used to compare AFLMC survey question nine with question ten.

Results. For this hypothesis there were 207 usable data points. The Paired-T test showed a mean difference of -.9710, a standard deviation of 1.548, a standard error of .108, and a 2-tail probability of .379. The 2-tail probability is larger than the predetermined significance level of .05. Therefore, there is not enough information to reject

the null hypothesis or to say that there is a difference in attitude toward diagonal cutting pliers supplied by DTC as compared to those supplied by GSA.

Objective 7

Determine statistically if technicians perceive a difference in quality between Stanley and GSA screwdrivers.

Null Hypothesis. There is no difference in screwdriver quality Stanley and GSA in the opinion of the technicians.

Test. The Paired-T test was used to compare AFLMC survey question eleven with question twelve.

Results. For this test there were 218 usable data points. The Paired-T test showed a mean difference of -1.0413, a standard deviation of 1.141, a standard error of .077, and a 2-tail probability of .001. The probability of .001 is significantly smaller than the predetermined significance level of .05. Therefore, there is sufficient data available to reject the null hypothesis and conclude that, in the opinion of the technicians, there is a significant difference in the quality of screwdrivers supplied by Stanley compared to GSA.

Objective 8

Determine if technicians feel that warranted tools have reduced their frustrations.

Null Hypothesis. There is no difference in the frustration felt based on which tool is used.

Test. The Paired-T test was used to compare AFLMC survey question thirteen with question sixteen.

Results. For this test, there were 193 usable data points. The Paired-T test showed a mean difference of .4301, a standard deviation of 1.322, a standard error of .095, and a 2-tail probability of .000. The probability of .000 is significantly smaller than the predetermined significance level of .05. Therefore, there is sufficient data available to reject the null hypothesis and conclude that, in the opinion of the technicians, there is a difference in the frustrations felt based on which tool is used.

CROSSTABS

The measure of association of the independent variables to the dependent variables most appropriate for this data is the square of eta value. The responses to each question (dependent variable) were checked for association based on major command, years of experience, or base location (independent variables) for all the questions. The eta

squared (eta^2) value indicates the proportion of variation in responses explained by each independent variable. Table 8 provides the final results for this test. Note that the Q 8, Q 10, and Q 12 versus the Major Command blocks indicate that over .10 of the variance is accounted for by the Major Command categories; none of the other independent variables even approaches .10. For those interested in the cell counts and frequencies, the CROSSTABS tables are in Appendix I.

Frequencies

Table 9 provides the reader with a complete frequency analysis of each AFLMC survey question. While this type of analysis is an acceptable technique, the authors did not consider it as accurate as the Analysis of Variance and the Paired-T test. Table 9 was included for the reader to compare the results with the different statistical analysis techniques used. See Appendix I for the actual computer product of Table 9.

Survey Comments

The previous sections dealt with statistical data analysis for the questions. Since the respondents supplied comments on over 27 percent of the surveys, the authors have included a table depicting the breakout of their comments. All the comments in Table 10 were extracted from the AFLMC survey.

TABLE 8

CROSSTABS ETA

Dependent Variable	Independent Variable					
	Years Experience		Major Command		North/South	
	ETA	ETA^2	ETA	ETA^2	ETA	ETA^2
Q 5	.11119	.01236	.11766	.0138	.15146	.0229
Q 6	.09274	.0086	.10370	.0108	.08903	.0079
Q 7	.05828	.0034	.12748	.0163	.21108	.0446
Q 8	.07094	.0050	.39267	*.1542	.09221	.0085
Q 9	.04742	.0022	.13087	.0171	.24227	.0587
Q 10	.08112	.0066	.49652	*.2465	.024843	.0006
Q 11	.11862	.0141	.21341	.0455	.19284	.0372
Q 12	.12189	.0149	.50793	*.2580	.06310	.0040
Q 13	.22049	.0486	.10538	.0111	.14024	.0207
Q 14	.13780	.0190	.12326	.0152	.11787	.0139
Q 15	.10178	.0104	.14477	.0210	.14891	.0222
Q 16	.10454	.0109	.15543	.0242	.09031	.0082

*Indication of association between independent and dependent variables.

TABLE 9

USER SURVEY QUESTION ANALYSIS

SURVEY QUESTION NUMBER 5*

What is your opinion of the quality of hand tools provided to engine mechanics in the past?

1	2	3	4	5	6
Very Poor	Marginal	Acceptable	Good	Excellent	Not Applicable or No Opinion

	Absolute Frequency (Responses)	Relative Frequency (Percent)	Cumulative Frequency (Percent)
Very Poor	121	23.1	23.1
Marginal	147	28.1	51.2
Acceptable	155	29.6	81.1
Good	81	15.5	96.6
Excellent	14	2.7	99.3
Not Applicable or No Opinion	5	.1	100.0

Median = 2 Mode = 3 Mean = 2.46

TABLE 9--Continued

SURVEY QUESTION NUMBER 6

What is your opinion of the quality of the SNAP-ON hand tools now being provided?

1	2	3	4	5	6
Very Good	Marginal	Acceptable	Good	Excellent	Not Applicable or No Opinion

	Absolute Frequency (Responses)	Relative Frequency (Percent)	Cumulative Frequency (Percent)
Very Poor	3	.5	.5
Marginal	11	2.1	2.6
Acceptable	59	11.3	13.9
Good	204	39.0	52.9
Excellent	243	46.5	99.4
Not Applicable or No Opinion	3	.5	100.0

Median = 4 Mode = 5 Mean = 4.29

TABLE 9--Continued

SURVEY QUESTION NUMBER 7

What is your opinion of the quality of needle nose pliers that were provided to engine mechanics in the past?

1	2	3	4	5	6
Very Poor	Marginal	Acceptable	Good	Excellent	Not Applicable or No Opinion

	Absolute Frequency (Responses)	Relative Frequency (Percent)	Cumulative Frequency (Percent)
Very Poor	81	15.5	15.5
Marginal	135	25.8	41.3
Acceptable	172	32.9	74.2
Good	104	19.9	94.1
Excellent	20	3.8	97.9
Not Applicable or No Opinion	11	2.1	100.0

Median = 3 Mode = 3 Mean = 2.70

TABLE 9--Continued

SURVEY QUESTION NUMBER 8

What is your opinion of the quality of the Diamond Tool Company needle nose pliers now being provided?

1	2	3	4	5	6
Very Good	Marginal	Acceptable	Good	Excellent	Not Applicable or No Opinion

	Absolute Frequency (Responses)	Relative Frequency (Percent)	Cumulative Frequency (Percent)
Very Poor	25	4.8	4.8
Marginal	24	4.6	9.2
Acceptable	48	9.2	18.4
Good	93	17.8	36.2
Excellent	37	7.1	43.3
**Not Applicable or No Opinion	296	56.6	100.0

Median = 3 Mode = 4 Mean = 3.41

TABLE 9--Continued

SURVEY QUESTION NUMBER 9

What is your opinion of the quality of the diagonal cutting pliers that were provided to engine mechanics in the past?

1	2	3	4	5	6
Very Good	Marginal	Acceptable	Good	Excellent	Not Applicable or No Opinion

	Absolute Frequency (Responses)	Relative Frequency (Percent)	Cumulative Frequency (Percent)
Very Poor	76	14.5	14.5
Marginal	89	17.0	31.5
Acceptable	172	32.9	64.4
Good	143	27.3	91.7
Excellent	25	4.8	96.5
Not Applicable or No Opinion	18	3.4	100.0

Median = 3 Mode = 3 Mean = 2.90

TABLE 9--Continued

SURVEY QUESTION NUMBER 10

What is your opinion of the quality of the Diamond Tool Company diagonal cutting pliers now being provided?

1	2	3	4	5	6
Very Good	Marginal	Acceptable	Good	Excellent	Not Applicable or No Opinion

	Absolute Frequency (Responses)	Relative Frequency (Percent)	Cumulative Frequency (Percent)
Very Poor	8	1.5	1.5
Marginal	9	1.7	3.2
Acceptable	40	7.7	10.9
Good	101	19.3	30.2
Excellent	56	10.7	40.9
**Not Applicable or No Opinion	309	59.1	100.0

Median = 4 Mode = 4 Mean = 3.90

TABLE 9--Continued

SURVEY QUESTION NUMBER 11

What is your opinion of the quality of the screwdrivers provided to engine mechanics in the past?

1	2	3	4	5	6
Very Poor	Marginal	Acceptable	Good	Excellent	Not Applicable or No Opinion

	Absolute Frequency (Responses)	Relative Frequency (Percent)	Cumulative Frequency (Percent)
Very Poor	73	14.0	14.0
Marginal	98	18.7	32.7
Acceptable	198	37.9	70.6
Good	131	25.0	95.6
Excellent	11	2.1	97.7
Not Applicable or No Opinion	12	2.3	100.0

Median = 3 Mode = 3 Mean = 2.82

TABLE 9--Continued

SURVEY QUESTION NUMBER 12

What is your opinion of the quality of the Stanley screwdrivers now being provided?

1	2	3	4	5	6
Very Poor	Marginal	Acceptable	Good	Excellent	Not Applicable or No Opinion

	Absolute Frequency (Responses)	Relative Frequency (Percent)	Cumulative Frequency (Percent)
Very Poor	4	.8	.8
Marginal	7	1.3	2.1
Acceptable	32	6.1	8.2
Good	122	23.3	31.5
Excellent	60	11.5	43.0
**Not Applicable or No Opinion	298	57.0	100.0

Median = 4 Mode = 4 Mean = 4.00

TABLE 9--Continued

SURVEY QUESTION NUMBER 13

The quality of hand tools provided in the past created frustration among engine mechanics I have worked with.

1	2	3	4	5	6
Strongly Disagree	Disagree	Undecided	Agree	Strongly Agree	Not Applicable or No Opinion

	Absolute Frequency (Responses)	Relative Frequency (Percent)	Cumulative Frequency (Percent)
Strongly Disagree	13	2.5	2.5
Disagree	52	9.9	12.4
Undecided	42	8.0	20.4
Agree	233	44.6	65.0
Strongly Agree	164	31.0	96.0
Not Applicable or No Opinion	19	3.6	100.0

Median = 4 Mode = 4 Mean = 3.96

TABLE 9--Continued

SURVEY QUESTION NUMBER 14

The introduction of warranted tools has improved engine mechanics attitudes.

1	2	3	4	5	6
Strongly Disagree	Disagree	Undecided	Agree	Strongly Agree	Not Applicable or No Opinion

	Absolute Frequency (Responses)	Relative Frequency (Percent)	Cumulative Frequency (Percent)
Strongly Disagree	12	2.3	2.3
Disagree	64	12.2	14.5
Undecided	107	20.5	35.0
Agree	241	46.1	81.1
Strongly Agree	79	15.1	96.2
Not Applicable or No Opinion	20	3.8	100.0

Median = 4 Mode = 4 Mean = 3.62

TABLE 9--Continued

SURVEY QUESTION NUMBER 15

I have been dissatisfied with the quality of hand tools provided to me in the past.

1	2	3	4	5	6
Strongly Disagree	Disagree	Undecided	Agree	Strongly Agree	Not Applicable or No Opinion

	Absolute Frequency (Responses)	Relative Frequency (Percent)	Cumulative Frequency (Percent)
Strongly Disagree	4	.8	.8
Disagree	73	13.6	14.4
Undecided	63	12.0	26.4
Agree	229	43.8	70.2
Strongly Agree	139	26.6	96.8
Not Applicable or No Opinion	15	2.9	100.0

Median = 4 Mode = 4 Mean = 3.84

TABLE 9--Continued

SURVEY QUESTION NUMBER 16

The introduction of warranted tools has reduced by frustration with tools.

1	2	3	4	5	6
Strongly Disagree	Disagree	Undecided	Agree	Strongly Agree	Not Applicable or No Opinion

	Absolute Frequency (Responses)	Relative Frequency (Percent)	Cumulative Frequency (Percent)
Strongly Disagree	14	2.7	2.7
Disagree	69	13.2	15.9
Undecided	83	15.9	31.8
Agree	238	45.5	77.3
Strongly Agree	99	18.9	96.2
Not Applicable or No Opinion	20	3.8	100.0

Median = 4 Mode = 4 Mean = 3.67

*See Appendix G for entire survey.

**Only nine of the seventeen bases surveyed had purchased Fraunholtz Tool Company supplied tools.

TABLE 10

SUMMARY OF AFLMC SURVEY COMMENTS

Cumulative Comments From 143 AFLMC Surveys	
Positive Comments	66
Negative Comments	28
Miscellaneous Comments	15
Specific Comments:	
Ratchets	27
Wrenches	21
Diagonal Cutting Pliers	19
Needle Nose Pliers	14
Sockets	13
Screwdrivers	4
Channel Lock Pliers	3
Cotterkey Extractors	3
Total Comments	213

Positive Comments:

From a master sergeant with seventeen years experience in maintenance: "excellent; expand the number of tools, shops, armed services; good idea; best thing done for 'wrench turners' in years; I consider it an insult to any good mechanic to have to use the junk tools we were provided in the past."

TABLE 10--Continued

From a master sergeant with twenty-two years maintenance experience: "If you give young airmen good quality tools, you will get a good quality product."

From a staff sergeant with five years maintenance experience: "Thanks for the privilege of using them [warranted tools] in my career field . . .; not so many stripped bolts and skinned knuckles; has made maintenance easier to accomplish."

Negative Comments:

From a sergeant with five years maintenance experience and a technical sergeant with nineteen years experience: "Tools are tools." From an airman first class with one year experience: "Quality is not the problem, the type of tool received is. We need specific tools for specific jobs."

From a sergeant with six years experience: "Quality has no direct effect on maintenance."

From a variety of maintenance personnel with various ranks and years experience: "Usability, proper tool not quality; past tools not as good; too much stress on abuse of warranted tools; too long for replacement."

Miscellaneous Comments:

Requests for tool boxes, individual tool kits, flashlights, and skinny thin-bladed screwdrivers; "let mechanic pick the tools for the shop."

TABLE 10--Continued

Specific Comments:

Wrenches: "open-end wrenches have shafts that are too thin for comfort; surface too smooth (especially when hands have a little oil on them); box-end wrenches too short, offset angle is too great."

Diagonal Cutting Pliers: "dulls easily; head is too large for tight spots; needs rubber holding device at cutting surface to catch cut wire."

Sockets -- 1/4, 3/8, 7/16 inch: "need to be deeper."

Ratchet -- 1/4 inch drive: "need nonslip handle, lock direction selector falls apart."

Needle Nose Pliers: "tip bends easily, would like it to have a diagonal cutting surface."

Telephone Interview

The telephone interview was designed to solicit opinions and positive or negative answers to specific questions. Each research objective and hypothesis is restated, followed by the statistical test used to interpret the data. Because the data base for the telephone interview falls under the ordinal level of measurement category, the previously used sophisticated tests are inappropriate. Therefore, the authors elected to employ the relative frequency technique as the statistical testing method. Relative frequency compares the number of desired responses of a

question to the total sample size, in this case seventy-five. The test used for all the telephone interview hypotheses requires that 60 percent or more of the respondents fail to answer with the desired response as established by the null hypothesis. The 60 percent mark will insure a majority. Finally, some of the opinions and comments of the respondents are presented.

Objective 9

Determine whether the mechanics know which tools are under the Warranted Tool Program (WTP).

Null Hypothesis. The mechanics do not know which tools are in the WTP.

Test. The test used required 60 percent or more affirmative answers to reject the null.

Results. The implementation plan distributed by AFLMC suggested that each command establish a marking system to identiy WTP tools. During the interview, 78 percent of the respondents knew which tools were warranted. Therefore, the null hypothesis is rejected.

Objective 10

Determine whether technicians detect a difference between GSA and WTP tool performance.

Null Hypothesis. Technicians do not detect a difference in tool performance beween GSA and WTP tools.

Test. The test required 60 percent or more of the answers to be affirmative to reject the null hypothesis.

Results. During the interview, 97 percent of the technicians detected a difference between GSA and WTP tool performance. Therefore, the null hypothesis is rejected.

Objective 11

Determine if the technicians preferred the WTP broken tool exchange program.

Null Hypothesis. Technicians show no preference for the WTP broken tool exchange program.

Test. The test required 60 percent or more of the respondents show a preference for the WTP broken tool exchange process to reject the null hypothesis.

Results. Since WTP broken tools are exchanged for new ones every time the tool company representative visits, which is at least twice a month, the wait for a replacement tool not immediately available from the Tool Crib is short. While, in the past, if the tool was not in the Tool Crib, one would have to be ordered. This could result in a several months wait for a replacement tool. A relative frequency of

86 percent of the respondents showed a preference for the WTP broken tool program. Therefore, the null hypothesis is rejected.

Objective 12

Determine whether technicians are dissatisfied with the Quality Deficiency Reporting (QDR) system for broken tools as it pertains to tools.

Null Hypothesis. The technicians are satisfied with the QDR system for broken tools.

Test. The test consists of rejecting the null if 60 percent or more of technicians are dissatisfied with the QDR system for broken tools.

Results. As a result of the interview, 73 percent of the respondents were dissatisfied with the QDR system. Therefore, the null hypothesis is rejected.

Objective 13

Determine whether mechanics feel there has been an improvement in the areas of safety, FOD, production, and equipment damage.

Null Hypothesis. Mechanics do not feel there has been improvements in the areas of safety, FOD, production, and equipment damage.

Test. The test consists of rejecting the null hypothesis if the relative frequency of respondents that feel there has been improvements in the listed areas is 60 percent or more.

Results. As a result of the interview, 73 percent of respondents indicated they felt there has been an improvement in the area of safety. The null hypothesis is rejected. Only 21 percent of the interviewees expressed the opinion that FOD had improved. Therefore, there is insufficient information for rejection of the null. Eighty-one percent of those interviewed indicated that production had improved. The null for this area is rejected. Damage to equipment also was seen as improving. Since 79 percent of the respondents felt that way, the null hypothesis is rejected. The only area we were not able to reject was for improvement in FOD.

Objective 14

Determine the technicians' overall opinion of the WTP.

Null Hypothesis. The technicians' overall opinion of the WTP is unfavorable.

Test. The test used required 60 percent or more of the respondents to have a favorable opinion of the WTP.

Results. During the interview, 97 percent of the respondents had a favorable opinion of the WTP. Therefore, the null hypothesis is rejected.

CHAPTER IV

CONCLUSIONS, DISCUSSION, AND RECOMMENDATIONS

Introduction

A problem has been identified with several solutions proposed. Each proposed improvement has been approached from an evolutionary point of view, with the concepts fully tested before they are widely applied. This is precisely what is being accomplished with the Warranted Tool Program (WTP). AFLMC conducted the initial investigation of the problem of quality hand tools and life-cycle cost analysis of those tools exhibiting high breakage rates. This research effort evaluated the attitudes expressed by USAF jet propulsion technicians toward the WTP. These attitudes were evaluated through the analysis of the questionnaire developed and distributed by AFLMC and the telephone survey developed and administered by the authors. This chapter provides the interpretations of the data analysis presented in Chapter III. The first section reviews the objectives and the findings of the data analysis. The following section discusses the impact of the results. The chapter closes with a list of the authors' recommendations concerning the WTP and areas for further research.

Conclusions

As is true of most questions about human opinions, no one answer always applies to the entire population. However, the sample size for both instruments was sufficiently large to allow inferences or generalizations that can be attributed to the population.

AFLMC Questionnaire

Objective 1. Determine if there is a difference in perceived quality of tools supplied by SNAP-ON and those supplied by GSA.

Here an attempt was made to determine if the participating technicians perceived a difference in tool quality between the tools supplied by SNAP-ON under the WTP and the tools previously supplied by GSA. The resultant data definitely showed that the respondents felt there was a difference in quality. An examination of the frequency bar charts (Appendix I) points out that the tools from SNAP-ON are seen as superior to GSA.

Objective 2. Determine statistically whether years of experience has an affect on quality perception.

The results were obtained by analyzing the difference between odd numbered (GSA tools) and even numbered (WTP tools) survey questions, 5 through 12 (Table 4), and comparing the differences to the independent variable, years of experience

(Table 5). The results indicated that for experience levels 1 through 3, there was no difference in their perception of quality. However, the data showed that in experience level 5, more than twelve years experience, a different perception of quality, opposite of that held by those in the other experience levels, existed.

Objective 3. Determine statistically whether the assigned command affects perception of tool quality.

The same method of analysis used in Objective 2 was also applied to Objective 3. The results indicate that three out of the four question comparisons concerning the major command to which the respondents were assigned did have an affect on the respondents' perception of tool quality. The major commands that exhibited a significantly different opinion were listed as subsets in the ANOVA product. Table 7 gives the breakout for the three subsets.

Objective 4. Determine statistically whether personnel assigned to bases north and south of 38° north latitude exhibit different attitudes pertaining to hand tool quality.

For the questions pertaining to needle nose pliers, diagonal cutting pliers, and screwdrivers, Q 7/8, Q 9/10, and Q 11/12, there is a vast difference in their perception of the quality of hand tools.

Objective 5. Determine statistically whether the DTC needle nose pliers are perceived to be of better quality than pliers previously supplied by GSA.

The result of the Paired-T test indicates that the respondents do not perceive any difference in quality between DTC and GSA needle nose pliers.

Objective 6. Determine statistically if technicians feel that there is a difference in the quality of the diagonal cutting pliers from DTC and those from GSA. The Paired-T test indicated that the respondents did not feel there was any difference in quality between the pliers bought from DTC and those previously supplied by GSA.

Objective 7. Determine statistically if technicians perceive a difference in quality between Stanley Tool Company and GSA supplied screwdrivers. Using the Paired-T test, the data indicates there is a significant difference in quality between screwdrivers supplied by the above sources.

Objective 8. Determine if technicians feel that warranted tools have reduced their frustrations. Using the Paired-T test to compare AFLMC survey question 13 with question 16, the data indicates there is a significant difference in the frustration level felt while using warranted tools.

Telephone Interview

The objective of the telephone interview was to obtain personal feelings and opinions about the WTP compared to the GSA tool procurement policy.

It appears from the personnel questioned that the WTP is held in high esteem. The only negative opinions encountered were toward DTC needle nose pliers and diagonal cutting pliers. In addition, these two tools are of no better quality than the ones previously supplied by GSA.

The specific objectives of the telephone interviews are listed and briefly discussed.

Objective 9. Determine whether the mechanics know which tools are under the WTP. Most of the mechanics interviewed were aware they were using warranted tools. Generally, the warranted tools had a special identification number etched into the tool as a means of identification.

Objective 10. Determine whether technicians detect a difference between GSA and WTP tool performance. Without a doubt, respondents were able to discern a significant difference between the tools. The GSA tools were easily distorted and broken while WTP tools are of high quality and, therefore, performed as they expected them to.

Objective 11. Determine which tool exchange process is preferred by the technicians. Most of the respondents favored the

WTP exchange process due to the ease with which they can exchange tools that become unusable.

Objective 12. Determine whether the technicians are dissatisfied with the Quality Deficiency Reporting (QDR) system. The respondents were not aware of the QDR system. They indicated that supply personnel had the responsibility of submitting QDRs.

Objective 13. Determine whether the mechanics feel there has been an improvement in the areas of safety, foreign object damage (FOD), production, and equipment damage due to the WTP. The majority of the respondents agreed that safety and production have definitely improved in areas where WTP tools are used. However, opinions on the other points were varied. Most individuals did not feel that an increase or decrease in FOD incidents was at all related to the WTP, while a small percentage of the respondents indicated that there would be a reduction in equipment damage as a result of the WTP.

Objective 14. Determine the technicians overall opinion of the WTP. An extremely small minority of the respondents were indifferent toward the WTP; the overwhelming majority praised the program. Higher rank personnel were disappointed the program had been so long in coming and felt it should be enlarged to include all of maintenance and all tools.

Discussion

While the authors cannot endorse a specific brand of hand tool, all indications are that the WTP tools are preferred by the users over those from the standard GSA procurement policy. The comparison of specific tools indicated an attitude of indifference toward the WTP's needle nose pliers and diagonal cutting pliers. The comments section of the AFLMC survey supplied some insight for this. The most frequent complaint towards the needle nose pliers is that they do not have a cutting surface. Where the user used to carry one tool, now he or she must employ two. The most cited problem with the diagonal cutting pliers lies with the size of the head. It is too large for many of the tight fitting places. The comments section also indicated strong support for the program.

The examination of whether certain categories displayed different attitudes produced some interesting results. For instance, it was expected that the one to two years of experience group would not exhibit a significant opinion towards the warranted tools because they would not have worked with the GSA tools long enough to become thoroughly frustrated. However, the authors had anticipated a greater differentiation for the seven to twelve and twelve plus years of experience groups. Only the latter group showed a significant difference, and that was only for the questions dealing

with the screwdrivers. A possible explanation for this may be that this year group, who would most probably be supervisors, do not perform as many of the tasks requiring screwdrivers. During the telephone interview, one of the complaints concerning the screwdrivers was that they are hard to grip with oily hands. Most supervisors would tend not to perform the oily tasks.

The examination of the influence of the assigned major command was originally incorporated to indicate if the different CTK and tool control requirements established by each command had an affect. A closer look into other differences in the commands invalidates this premise. Each command works with its own type of engine, which may or may not be the same as another command's. This is significant in that each engine type requires different size, shape, and torque capacity for the hand tools used. In addition, the AFRES and ANG personnel remain at their original base of assignment longer than their regular counterparts. A difference in attitude could be because the AFRES and ANG personnel will be working with those particular tools for the next twenty to thirty years.

The strong evidence pointing to a difference in opinions based on north or south regions leads one to believe that weather would have its affect on equipment which, in turn, would require sturdier tools. However, such a conclusion

would be false since the difference in attitudes was not evident for questions five and six. These are the sockets and wrenches, tools most often subjected to stress. As with the Major Commands category, the bases were not divided into groups by engine type. This may explain the difference in attitudes.

The measure of frustration with the straightforward questions of thirteen and sixteen resulted in concluding that changes in quality from GSA to WTP tools did make a difference to the jet propulsion technicians. However, it is possible that the expression of frustration may have also been directed toward the Air Force in general. For that reason, the authors developed a telephone interview guide aimed at some of the aspects and concerns that lead to frustration when working with poor quality tools. Such concerns as safety, FOD, damage to equipment, and tool replacement time and quality were incorporated in the interview.

The results of the telephone interview also support the WTP with many of the participants urging program expansion. Of the frustrations felt by the technicians since implementation of the WTP, many expressed fewer frustrations. The only area of concern not seen as improving since the institution of the program was in FOD. The shorter time for broken tool exchange is regarded as one of the big pluses of the program.

It was disturbing to note that 40 percent of those reporting that a tool broke while they were using it never filed a Quality Deficiency Report (QDR). One individual felt that the filing of a QDR was the responsibility of supply personnel, not the user. For those that did file a QDR, there were complaints of the length of time before a final disposition of the report was received. However, all were received before the 60-day time limit expired.

As mentioned previously, one aspect of incorporating warranted items is the ability to manage those items for insuring the maximum benefit. Essential to this concept is the ability to determine which items belong to the WTP. The results of the telephone interview indicated that over 70 percent of the mechanics knew which tools were under warranty. However, 20 percent stated they knew which because of briefings or a list posted on a bulletin board, which brings us to recommendations.

Recommendations

For the WTP

1. Require all warranted tools be marked.

2. Offer a variety of each type so that a tool can be chosen that fits the engine type.

3. Implement the WTP Air Force-wide.

4. Reevaluate the DTC needle nose and diagonal cutting pliers.

For Future Research

1. Determine if technicians have a bias towards a particular brand of hand tool.

2. Determine whether engine type influences attitudes toward which hand tool procurement policy is used, GSA or WTP.

3. Develop a life-cycle cost model designed specifically for hand tools.

4. Reevaluate the QDR system.

5. Investigate alternatives for warranted tool management.

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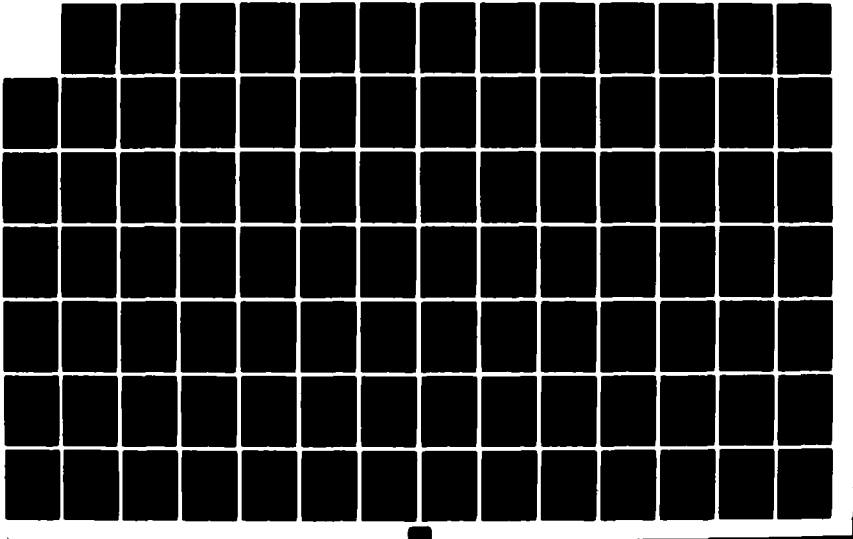
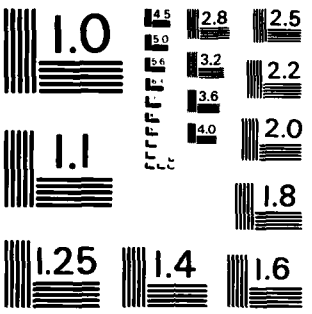




APPENDICES

APPENDIX A

DEFINITIONS

A. Air Force Logistics Management Center (AFLMC): AFLMC is located at Gunter Air Force Base, Alabama.

B. Commercial Item Descriptions (CID): Specific manufacturers' descriptions of items sold on the commercial market.

C. Composite Tool Kit (CTK): A kit of tools specifically made so that a group of maintenance personnel can work out of it.

D. Federal Specifications: Specific descriptions of an item telling the exact size, type of material, hardness, etc., items must meet to be acceptable for procurement by Government agencies.

E. General Services Administration (GSA): An agency of the U.S. Government responsible for, among other things, the procurement and storage of items common to all Government agencies.

F. Quality Deficiency Reporting (QDR) System: A system whereby deficiencies discovered in manufactured or rebuilt items are reported to the appropriate procurement agency so that reoccurrences are prevented or reduced, e.g., Technical Order (TO) 00-35D-54.

G. SNAP-ON: A corporation in Kenosha, Wisconsin that manufactures lifetime warranted tools.

APPENDIX B

SPECIFICATIONS

GGG-W-1437
January 5, 1970

FEDERAL SPECIFICATION

WRENCH, SOCKET AND BOX END (THIN WALL -- HIGH STRENGTH)

This specification was approved by the Commissioner, Federal Supply Service, General Services Administration, for the use of all Federal agencies.

1. SCOPE AND CLASSIFICATION

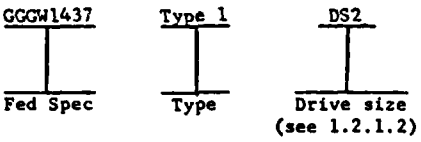
1.1 Scope. This specification covers 12-point, thin wall, high-strength box end wrench, socket, socket universal joint, torque adapter, and reversible ratchet handle, designed for general use on aerospace jet engines.

1.2 Classification. Wrench shall be of the following types, and size or class, as specified (see 6.2):

1.2.1 Type I, reversible ratchet handle:

Size 1 — 1/4-inch square drive.
Size 2 — 3/8-inch square drive.
Size 3 — 1/2-inch square drive.

1.2.1.1 Identification code (reference number construction). The identification code shall be developed in the following form:



1.2.1.2 Drive size. The drive size shall be identified by the two-letter symbol "DS" followed by a one-digit number. The size shall be identified in accordance with 1.2.1.

FSC 5120

GGG-W-1437
AMENDMENT 1
November 7, 1972

FEDERAL SPECIFICATION

WRENCH, SOCKET AND BOX END (THIN WALL—HIGH STRENGTH)

This amendment, which forms a part of Federal Specification GGG-W-1437, dated January 5, 1970, was approved by the Commissioner, Federal Supply Service, General Services Administration for the use of all Federal agencies.

PAGES 15 THROUGH 20

FIGURES 1 through 6: Delete and substitute revised figures 1 through 6.

MILITARY CUSTODIANS:

Army - AV
Navy - AS
Air Force - 84

Review activities:

Army - GL
Navy - AS, SH

User activities:

Army - WC
Navy - OS

Preparing activity:

Army - AV

Project No. 5120-0730

FSC 5120

1.2.2 Type II, sockets, 12-point:

Size 1 — 1/4-inch square drive.
Size 2 — 3/8-inch square drive.
Size 3 — 1/2-inch square drive.

Class 1 — Double hexagon, regular.
Class 2 — Double hexagon, deep.
Class 3 — Double hexagon, socket universal joint.

1.2.2.1 Identification code (reference number construction). The identification code shall be developed in the following form:

GGGW1437	Type 2	DS1	Class 2	WS06
Fed Spec	Type	Drive size (1.2.2.2.)	Class (1.2.2.3)	Wrench size opening (1.2.2.4).

1.2.2.2 Drive size. The drive size shall be identified by the two-letter symbol "DS" followed by a one-digit number. The size shall be identified in accordance with 1.2.2.

1.2.2.3 Class. The class shall be identified in accordance with 1.2.2.

1.2.2.4 Wrench size. The wrench size shall be identified by the two-letter symbol "WS" followed by a two-digit number expressed in increments of 1/32-inch.

1.2.3 Type III, box end wrench.

Class 1 — 15 degrees offset.
Class 2 — Deep offset.

1.2.3.1 Identification code (reference number construction). The identification code shall be developed in the following form:

GGGW1437	Type 3	Class 2	WS08A	WS10B
Fed Spec	Type	Class (1.2.3.2)	Small head wrench opening (1.2.3.3)	Large head wrench opening (1.2.3.4).

2

1.2.3.2 Class. The class shall be identified in accordance with 1.2.3.

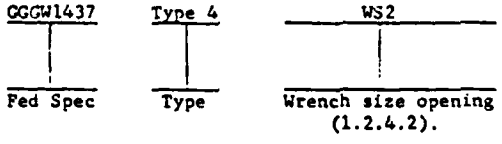
1.2.3.3 Wrench, small head size. The small head wrench opening shall be identified by the two-letter symbol "WS" followed by a two-digit number expressed in increments of 1/32-inch. These four digits shall be followed by the letter "A" denoting the small head.

1.2.3.4 Wrench, large head size. The large head wrench opening shall be identified by the two-letter symbol "WS" followed by a two-digit number expressed in increments of 1/32-inch. These four digits shall be followed by the letter "B" denoting the large head.

1.2.4 Type IV, torque adapter:

	Nominal opening	Length	Square drive
Size 1	5/16-inch	2 inches	3/8-inch
Size 2	3/8-inch	2 inches	3/8-inch
Size 3	7/16-inch	2 inches	3/8-inch
Size 4	1/2-inch	2 inches	3/8-inch
Size 5	9/16-inch	2 inches	3/8-inch.

1.2.4.1 Identification code (reference number construction). The identification code shall be developed in the following form:



1.2.4.2 Wrench size. The wrench size shall be identified by the two-letter symbol "WS" followed by a one-digit number. The size shall be identified in accordance with 1.2.4.

2. APPLICABLE DOCUMENTS

2.1 The following documents of the issue in effect on date of invitation for bids or request for proposal, form a part of this specification to the extent specified herein:

Federal Specifications:

GGG-W-641	—	Wrench, Socket; (and Sockets, Handles, and and Attachments for Socket Wrenches; Hand).
PPP-B-601	—	Boxes, Wood, Cleated-Plywood.

Federal Standard:

Fed. Std. No. 123 — Marking for Domestic Shipment (Civilian Agencies).

(Activities outside the Federal Government may obtain copies of Federal Specifications, Standards, and Handbooks as outlined under General Information in the Index of Federal Specifications and Standards and at the prices indicated in the Index. The Index, which includes cumulative monthly supplements as issued, is for sale on a subscription basis by the Superintendent of Documents, U. S. Government Printing Office, Washington, D. C. 20402.

(Single copies of this specification and other Federal Specifications required by activities outside the Federal Government for bidding purposes are available without charge from Business Service Centers at the General Services Administration Regional Offices in Boston, New York, Washington, D. C., Atlanta, Chicago, Kansas City, Mo., Fort Worth, Denver, San Francisco, Los Angeles, and Seattle, Washington.

(Federal Government activities may obtain copies of Federal Specifications, Standards, and Handbooks and the Index of Federal Specifications and Standards from established distribution points in their agencies.)

Military Specification:

MIL-H-15424 — Hand Tools; Packaging of.

Military Standards:

MIL-STD-105	—	Sampling Procedures and Tables for Inspection by Attributes.
MIL-STD-129	—	Marking for Shipment and Storage.
MIL-STD-130	—	Identification Marking of US Military Property.
MS21250	—	Bolt, 12 Point, External Wrenching, 180,000 Psi.

(Copies of Military Specifications and Standards required by contractors in connection with specific procurement functions should be obtained from the procuring activity or as directed by the contracting officer.)

3. REQUIREMENTS

3.1 Wrench, socket, socket universal joint, torque adapter, and reversible ratchet handle. Wrench, socket, socket universal joint, torque adapter, and reversible ratchet handle shall be generally as shown on figures 1 through 6.

3.1.1 First articles. This specification requires first-article testing, as specified in 4.2.1. The first articles may be either pre-production samples or production items which conform to all requirements of this specification. In either case the first articles shall be manufactured in the same facilities, and shall be identical with, the production items in accordance with the terms of the contract. Approval of the first articles does not relieve the supplier of the responsibility for complying with all applicable provisions of this specification.

3.2 Materials. Materials used shall be such as to produce tools conforming to this specification.

3.3 Design and construction.

3.3.1 Drive tangs and openings. The male drive tang and the female drive opening shall be in accordance with table I and figure 1 of GGG-W-641.

3.3.2 Internal wrenching. The internal wrench design of the box wrench or socket wrenching profile shall be so configured that when mated with 12-point fasteners conforming to MS21250, they transmit torque to the fasteners without bearing on the outer 5 percent of the fastener wrenching points (see fig. 1).

3.3.3 Hardness. Wrench, socket, socket universal joint, drive tangs, and attachments shall be hardened to not less than 38, nor more than 56, on the Rockwell "C" scale.

3.3.4 Edges and corners. All edges and corners shall be rounded, chamfered, and free of sharp edges. The inside edges of the 12-point opening shall be chamfered.

TABLE I. Reversible ratchet handle dimensions

Square drive	Overall length	Head dimensions			Hand grip diameter or width	Gear head number of teeth in gear	Horizontal or side movement of gear in housing	Vertical or up and down movement of gear in housing	Reverse torque ratcheting starting	Test load
		Width	Head thickness less tang	Head thickness housing only						
Inch	Min inches	Max inches	Max inch	Max inch	Min inch	Min inch	Max inch	Max inch	Max in/ozs	Min in/lbs
1/4	6-1/4	1-1/8	9/16	7/16	5/16	18	0.010	0.015	8	600
3/8	10	1-13/16	7/8	5/8	1/2	18	0.010	0.015	16	1,800
1/2	14	1-15/16	1	3/4	5/8	30	0.010	0.015	35	5,000

3.3.5 Finish.

3.3.5.1 Surface roughness. All external surfaces shall be free from pits, nodules, forge flash, burrs, cracks, laps, seams, and other defects. All external surfaces shall be ground and buffed, or finished by an equivalent method, and provided with a bright chromium finish. The external surfaces of wrench, socket, socket universal joint, torque adapter, and reversible ratchet handle shall have a surface roughness of 30 micro inches (arithmetical) or better, using a point .030-inch cutoff on surface measuring machine. The periphery of head and shank of the reversible ratchet handle shall have a surface roughness of 30 micro inches (arithmetical) or better, using a point .030-inch cutoff on surface measuring machine. Periphery of heads of type IV (torque adapter) shall have a surface roughness of 30 micro inches.

3.3.5.2 Coating. The chromium coating shall be adherent, smooth, continuous, and free from pits, blisters, nodules, and any other defects which could interfere with their protective value and serviceability. The coating shall be electro-deposited, consisting ot a minimum thickness of 0.0002-inch of nickel followed by a minimum thickness of 0.00001-inch of chromium.

3.4 Type I, reversible ratchet handle. The reversible ratchet handle, size as specified in 6.2, shall conform to type III, class 2 of GGG-W-641, except that the dimension shall conform to table I of this specification.

3.5 Type II, socket (see 1.2.2).

3.5.1 Classes 1 and 2. Class 1 and class 2 sockets, size as specified (see 6.2(b)), shall be double-hexagon (12-point) type. Nut or bolt engaging surfaces shall be broached, punched, or machined in a smooth and well defined manner. The configuration of the surfaces shall be well defined. The engaging surfaces shall be suitable for use on bolt head surfaces conforming to MS21250. The sockets shall conform to the dimensional and test load requirements shown on figure 2.

3.5.2 Class 3, socket universal joint. Class 3 socket universal joint, size as specified in 6.2, shall be double-hexagon design. A friction-type tension device shall hold the socket against gravity in any position. The tension device shall be self-compensating for normal moderate wear. The socket universal joint shall rotate in a complete arc when the angular deviation of either member is 40 degrees from the common centerline. Socket universal joint shall conform to figure 3.

3.5.3 Bolt clearance hole. Bolt clearance hole shall be from the base of the 12-point opening to the base of the square drive for the regular socket, and 1.20 inches deep minimum from the 12-point drive end for the deep socket. Diameter of the bolt clearance hole shall conform to that shown on figure 2.

3.6 Type III, box end wrench.

3.6.1 Class 1. The 15-degree offset wrench, size as specified (see 6.2), shall be 12-point, double-hexagon, double-head design, as shown on figure 5.

3.6.2 Class 2. The deep offset wrench, size as specified (see 6.2), shall be 12-point, double-hexagon, double-head design, as shown on figure 4.

3.7 Type IV, torque adapter. Torque adapter shall be of the 12-point, double-hexagon design with a 3/8-inch female square drive, as shown on figure 6.

3.8 Sets of tools. When sets are specified (see 6.2(c)), the parts of the sets shall conform to the requirements of the respective types, classes, or sizes, for one each of the types, classes, or sizes of tools covered in this specification.

3.8.1 Boxes for sets. Tools when ordered as a set (see 6.2), shall be furnished in a metal box. All of the sockets in the set shall be contained in one compartment shaped in such a manner that the sockets are stored in progressive positions from the smallest to the largest. An additional compartment shall be provided to separate the ratchet handles from other tools in the set. The box shall be of not less than #22 gage sheet metal, and shall be of durable and rigid construction. The box shall have a cover held on by a continuous piano hinge and shall have a positive catch. Both interior and exterior surfaces of the box shall have a durable coating of paint or enamel.

3.9 Identification of product (see 1.2). Wrench, socket, socket universal joint, torque adapter, and reversible ratchet handle shall be permanently identified with the manufacturer's name or trademark, so that the source of manufacture may be readily determined. Tools shall also be permanently marked to indicate the nominal wrench opening (distance across flats) in fractions. Identification and marking shall be in accordance with MIL-STD-130.

3.10 Workmanship. Workmanship shall be in accordance with high-grade commercial practice. Tools shall be free from rust, fins, burrs, external sharp or rough edges, corners, or surfaces, and other defects which could impair service and durability.

4. QUALITY ASSURANCE PROVISIONS

4.1 Responsibility for inspection. Unless otherwise specified in the contract or purchase order, the supplier is responsible for all inspection requirements as specified herein. Except as otherwise specified in the contract or order, the supplier may use his own facilities suitable for the performance of the inspection requirements specified herein, unless disapproved by the Government. The Government reserves the right to perform any of the inspections set forth in the specification where such inspections are deemed necessary to assure supplies and services conform to prescribed requirements.

4.2 Classification of inspections and tests. The inspection and testing requirements specified herein are classified as (1) first article and (2) quality conformance.

4.2.1 First articles. First article inspection (see 3.1.1) shall consist of the number of samples as specified by the procuring activity of each type, size, or class under a contract or order (see 6.2). All tools shall pass the test specified in 4.4.

4.2.2 Quality conformance. Quality conformance inspection shall consist of all tests specified in 4.4 on sample items selected in accordance with 4.3.

4.3 Sampling.

4.3.1 Lot definition.

4.3.1.1 Production lot. A production lot shall consist of all tools or sets manufactured by the same process, heat-treated in the same manner, and produced as one continuous run or order.

4.3.1.2 Inspection lot. All tools or sets of the same type, size, or class taken from a production lot and offered for delivery at one time shall be considered a lot for purposes of inspection and tests.

4.3.2 Tools. A random sampling of tools shall be taken from the inspection lot and inspected in accordance with level I of MIL-STD-105. The acceptable quality level (AQL) shall be 1.5 percent defective.

4.3.3 Sets (see 3.8). A random sampling of tool sets shall be taken from the inspection lot and inspected in accordance with level S-4 of MIL-STD-105. The AQL shall be 1.5 percent defective.

4.4 Tests. Each sample selected in accordance with 4.3.2 or 4.3.3, as applicable, shall be tested in accordance with the tests specified in 4.4.1 through 4.4.2.1.3 to verify compliance with this specification. Any tool in each lot containing one or more defects shall be rejected and if the number of defective items in any lot exceeds the acceptance number for that sampling, the lot shall be rejected. The handles shall be subjected to the tests of GGG-W-641 to determine compliance with that specification and the load test as modified by table I of this specification.

4.4.1 Hardness. The hardness requirements of 3.3.3 shall be verified on a Rockwell tester, using a diamond penetrator and employing a 150-kilogram major load. Surfaces shall be suitably ground for the test. Before the tools are tested, the plating, decarburization, and hardened cases shall be removed.

4.4.2. Load. Load tests for tools shall be conducted on the sample tools to determine conformance with the test load requirements shown on figures 1 through 6, as applicable.

4.4.2.1 Application of test loads.

4.4.2.1.1 The loads shall be applied either with torque producing machines or with a lever with dead weights. Each sample tool tested shall be capable of withstanding 2,000 applications of the minimum torque endurance load as specified on figures 2, 4, 5, and 6, as applicable. After each application the tool shall be indexed 30 degrees. Each socket shall be subjected to the proof torque load specified on figure 2. Using a mandrel and drive tang, the load shall be applied for 10 seconds and then removed. The test (torque) load is defined as that torque tending to cause rotation of the mandrel about its axis line (which is also the axis line of the wrench opening). The test load is the product of the applied force and the effective lever arm. The applied force is that component of the total force mutually perpendicular to the mandrel axis line and the effective lever arm. The effective lever arm is the shortest distance between the mandrel axis line and the line of action through which the applied force acts.

4.4.2.1.2 The test load shall be applied as follows: A square test plug of suitable strength and complying with the drive end dimensional requirements of the drive tang specified in table I and on figure 1 of GGG-W-641, shall be used. The test plug may be driven by any suitable manual or mechanical means. The socket shall then be engaged on the end of a mandrel to a maximum depth in accordance with table II. Box wrench and adapters shall use full insertion depth. A stop may be set at the outer end of the test plug to prevent slippage of the socket end-wise from the mandrel. The mandrel shall be hexagon-shaped. The maximum hexagon size of all mandrels shall not exceed the nominal size of the socket. The minimum hexagon size shall be at the nominal, minus 0.002-inch. Mandrels shall be hardened to not less than 55 on the Rockwell "C" scale and shall be smoothly finished.

4.4.2.1.3 Examination for cracks, deformation, and permanent set. After application of the test load, the tools shall be examined for cracks, deformation, permanent set, and any other defect caused by the load tests. The handles of wrenches shall not show a permanent angular distortion (set) of more than 2 degrees. The amount of set shall be determined by measuring the permanent linear displacement of the opposite head. A fixture for measuring this deformation shall be made before applying the test load. The amount of permanent linear displacement of the opposite head shall not be more than the head center-to-center dimension multiplied by the tangent of 2 degrees.

4.5 Inspection of preparation for delivery. Preservation and packaging, packing, and marking for shipment of handles, sockets, torque adapters, and wrenches shall be inspected to determine compliance with section 5 of this specification.

TABLE II. Maximum depth of mandrel insertion

Nominal wrench size	Mandrel engagement maximum depth from face of socket	Nominal square drive
0.1875-inch	0.125-inch	.250-inch
.2188-inch	.125-inch	
.2500-inch	.125-inch	
.2812-inch	.141-inch	
.3125-inch	.156-inch	
.3438-inch	.174-inch	
.3750-inch	.188-inch	
.4375-inch	.218-inch	
.5000-inch	.234-inch	
0.3125-inch	.187-inch	.375-inch
.3750-inch	.218-inch	
.4375-inch	.250-inch	
.5000-inch	.313-inch	
.5625-inch	.375-inch	
.6250-inch	.438-inch	
.6875-inch	.468-inch	
.7500-inch	.500-inch	
0.6250-inch	.468-inch	.500-inch
.6875-inch	.531-inch	
.7500-inch	.562-inch	

5. PREPARATION FOR DELIVERY

5.1 Preservation and packaging. Preservation and packaging shall be level A or C, as specified (see 6.2).

5.1.1 Level A. Preservation and packaging shall be in accordance with level A of MIL-H-15424.

5.1.2 Level C. Wrenches shall be preserved and packaged in a manner to prevent deterioration or damage during handling and shipping from the supplier to the first receiving activity.

5.2 Packing. Packing shall be level A, B, or C, as specified (see 6.2).

5.2.1 Level A. Individual tools or sets, packaged as specified, shall be packed in accordance with level A of MIL-H-15424. Exterior containers shall conform to oversea type of PPP-B-601, and surface-treated in accordance with the requirements of the specification.

5.2.2 Level B. Individual tools or sets, packaged as specified, shall be packed in accordance with level B of MIL-H-15424.

5.2.3 Level C. Individual tools or sets, packaged as specified, shall be packed in accordance with level C of MIL-H-15424.

5.3 Marking for shipment. In addition to any special marking required by the contract or order, shipments shall be marked in accordance with Fed. Std. No. 123 or MIL-STD-129, as applicable.

6. NOTES

6.1 Intended use. This specification covers wrench, socket, socket universal joint, torque adapter, and reversible ratchet handle for attaching and detaching special high-strength fasteners for general use on aerospace jet engines.

6.2 Ordering data. Purchasers should select the preferred options offered herein, and include the following data in procurement documents.

a. Title, number, and date of this specification.

b. Type, size or class of tool required (see 1.2, 3.4, 3.5, 3.6 and 3.7).

c. Specify number of samples required for first article inspection (see 4.2.1).

d. If sets of tools are required, the class and sizes of box wrenches (see figs. 4 and 5); the class and sizes of sockets (see figs. 2 and 3); size of the torque adapter (see fig. 6); and the size of the reversible ratchet handle which should be included in each set (see table I).

e. Level of preservation and packaging, and of packing, required (see 5.1 and 5.2).

f. Whether special marking for shipment is required (see 5.3).

MILITARY CUSTODIANS:

Army - Aviation Systems Command
Navy - AS
Air Force - 84

Review activities: GL, AS

User activities: WC, SH, OS

Preparing activity:

Army -AV

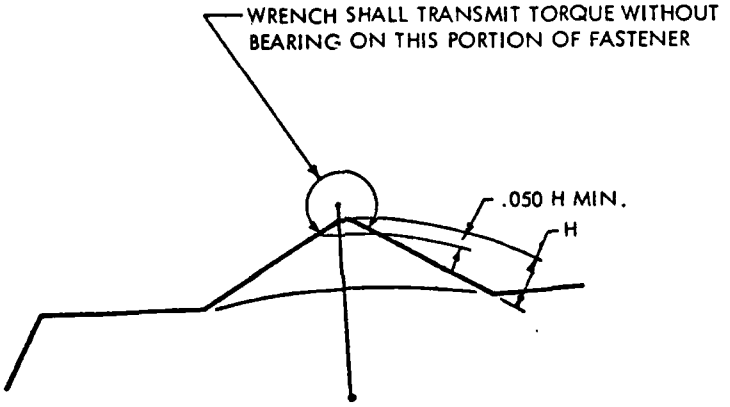
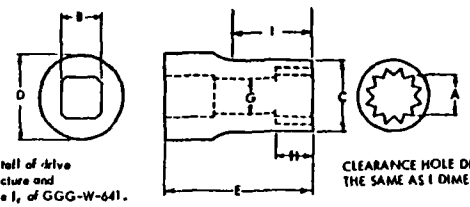


FIGURE 1 - Internal wrench engagement.



Note: For detail of drive end, see Manufacture and Design, and table I, of GGG-W-641.

CLEARANCE HOLE DEPTH SHALL BE THE SAME AS I DIMENSION

TYPE II, CLASS 1 AND CLASS 2 SOCKET.

SOCKET DIMENSIONS IN INCHES.														
FRAC NOMINAL WRENCH OPENING A	NOMINAL SQUARE DRIVE SIZE B	MAX DIA. SOCKET END C	MAX. DIA WRENCH END D	MIN REG. I	MIN. DEEP I	MIN BROACH DEPTH H	MIN OVERALL LENGTH REGULAR E	MAX OVERALL LENGTH REGULAR E	MIN OVERALL LENGTH DEEP E	MAX OVERALL LENGTH DEEP E	MIN. DIA. BOLT HOLE CLEARANCE G	MIN TORQUE ENDURANCE LOAD (IN-LBS.)	PROOF TORQUE LOAD (IN-LBS)
3/16	.250	.312	.440	.281	.756	.156	.860	1.312	1.937	2.125	.156	60	190
7/32	.250	.359	.440	.343	.811	.187	.860	1.312	1.937	2.125	.188	75	225
1/4	.250	.390	.440	.374	.842	.218	.860	1.312	1.937	2.125	.203	100	300
9/32	.250	.437	.440	.485	.993	.242	.860	1.312	1.937	2.125	.250	125	375
5/16	.250	.468	.468			.265	.860	1.312	1.937	2.125	.265	150	450
11/32	.250	.515	.515			.280	.860	1.312	1.937	2.125	.281	175	525
3/8	.250	.540	.540			.312	.860	1.312	1.937	2.125	.328	200	600
7/16	.250	.625	.625			.328	.860	1.312	1.937	2.125	.390	250	600
1/2	.250	.703	.703			.359	.860	1.312	1.937	2.125	.452	275	600
5/16	.375	.470	.697	.490	1.015	.234	.985	1.562	1.985	2.375	.265	150	500
3/8	.375	.555	.697	.551	1.125	.295	.985	1.562	1.985	2.375	.328	300	900
7/16	.375	.625	.697	.671	1.187	.359	.985	1.562	1.985	2.375	.390	500	1350
1/2	.375	.740	.740			.437	.985	1.781	1.985	2.375	.452	600	2000
9/16	.375	.796	.796			.500	.985	1.781	1.985	2.375	.516	1100	2000
5/8	.375	.859	.859			.531	.985	1.781	2.000	2.375	.578	1200	2500
11/16	.375	.953	.953			.578	.985	1.781	2.000	2.530	.640	1200	2500
3/4	.375	1.015	1.015			.625	1.000	1.781	2.000	2.530	.703	1500	2500
1/2	.500	.765	.875	.714	1.375	.437	1.480	2.000	2.000	3.027	.453	1000	3000
9/16	.500	.828	.937	.812	1.500	.500	1.480	2.000	2.000	3.027	.515	1400	4000
5/8	.500	.906	.937	.888	1.625	.531	1.480	2.000	2.000	3.027	.578	1800	5500
11/16	.500	.984	.984			.593	1.480	2.000	2.000	3.027	.640	2150	6500
3/4	.500	1.067	1.067			.625	1.480	2.000	2.000	3.027	.703	2500	7500

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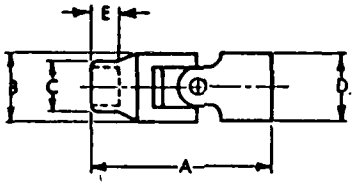
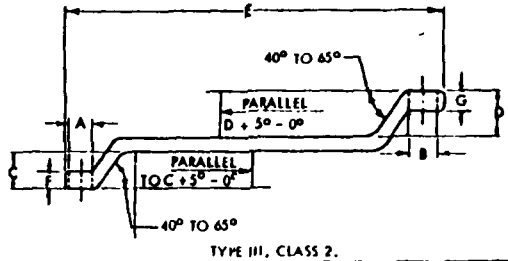


TYPE II, CLASS 3 SOCKET.

SOCKET DIMENSIONS IN INCHES									
NOMINAL OPENING	SQUARE DRIVE SIZE	OVERALL LENGTH MAX A	OUTSIDE DIAMETER			DEPTH OF OPENING NUT END MIN E	BOLT CLEARANCE		TEST LOAD
			NUT END B MAX	*C MAX	DRIVE END D MAX		DIA MIN	DEPTH MIN	
1/4	1/4	1.312	.500	.385	.500	.218	.203	.374	275
5/16	1/4	1.437	.500	.460	.500	.281	.265	.468	450
3/8	1/4	1.500	.500	.530	.500	.340	.328	.540	500
7/16	3/8	2.000	.690	.656	.690	.421	.390	.621	825
1/2	3/8	2.125	.690	.720	.690	.437	.453	.637	925
9/16	3/8	2.187	.690	.780	.690	.500	.515	.700	1100
5/8	3/8	2.250	.690	.875	.690	.531	.578	.731	1250
11/16	3/8	2.562	.750	.968	.750	.593	.640	.793	1500
3/4	3/8	2.750	.750	1.031	.750	.625	.703	.825	1650

*NOTE: ON UNITS WITH "TURNED" OR "TAPERED" NUT END DIAMETER (C SMALLER THAN B), THE C MAXIMUM DIAMETER SHALL EXTEND AT LEAST A DISTANCE EQUAL TO ONE-HALF OF THE LISTED E MINIMUM DIMENSION FROM THE NUT END.

FIGURE 3. SOCKETS, UNIVERSAL JOINT, 12 POINT, HIGH STRENGTH, THIN WALL.



TYPE III, CLASS 2.

BOX WRENCH DIMENSIONS DEEP OFFSET

WRENCH OPENING DISTANCE ACROSS FLATS		OUTSIDE DIAMETER OF HEAD		PERMITTED ECCENTRICITY OF WRENCH OPENINGS TO OUTSIDE DIA. OF HEADS	THICKNESS OF HEADS		HEIGHT TO WHERE OFFSET BLENDS WITH HANDLE				OVERALL LENGTH		MIN TORQUE ENDURANCE LOAD (IN/LBS)		TEST LOAD	
A	B	A	B		F	G	C		D		E		SMALL HEAD	LARGE HEAD	SMALL HEAD	LARGE HEAD
SMALL HEAD	LARGE HEAD	SMALL HEAD	LARGE HEAD		SMALL HEAD	LARGE HEAD	SMALL HEAD		LARGE HEAD		MIN INCH	MAX INCH				
INCH	INCH	MAX	MAX	MAX INCH	MAX INCH	MAX INCH	MAX INCH	MIN INCH	MAX INCH	MIN INCH			MIN IN/LBS	MIN IN/LBS	MIN IN/LBS	MIN IN/LBS
3/16	7/32	.296	.359	.010	.188	.203		.188		.218	5	8	50	60	150	180
3/16	1/4	.296	.400	.010	.188	.219		.188		.218	5	8	50	70	150	210
7/32	1/4	.359	.400	.010	.203	.219		.218		.218	5	8	60	70	180	210
7/32	9/32	.359	.421	.010	.203	.234		.218		.281	6	8	60	75	180	225
1/4	9/32	.400	.421	.010	.219	.234		.218		.281	6 1/2	8	70	75	210	225
1/4	5/16	.400	.470	.010	.219	.250		.218		.296	7	9	70	85	210	350
5/16	11/32	.470	.531	.010	.250	.281		.296		.344	7	9	85	105	350	375
5/16	3/8	.470	.581	.010	.250	.312		.296		.500	7	9	85	125	350	650
3/8	7/16	.581	.687	.010	.312	.343		.500		.562	8	9	125	250	650	1000
7/16	1/2	.650	.781	.010	.343	.359		.562		.562	8	10 1/8	250	400	1000	1400
1/2	9/16	.781	.875	.010	.359	.406		.562		.625	8 3/4	10 3/4	400	550	1400	1800
9/16	5/8	.875	.953	.010	.406	.468		.625		.717	9	11	550	750	1800	2400
5/8	3/4	.953	1.125	.015	.468	.531		.717		.812	10	12	750	1000	2400	3000
11/16	3/4	1.046	1.125	.015	.500	.531		.717		.812	10	12	750	1000	2400	3000
11/16	13/16	1.046	1.203	.015	.500	.562		.717		.812	10 3/4	12 3/4	750	1000	2400	3000

FIGURE 4. BOX WRENCH, DOUBLE END, 12 POINT, DEEP OFFSET, EACH END HIGH STRENGTH, THIN WALL, LONG LENGTH

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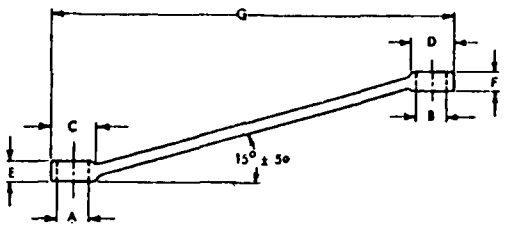
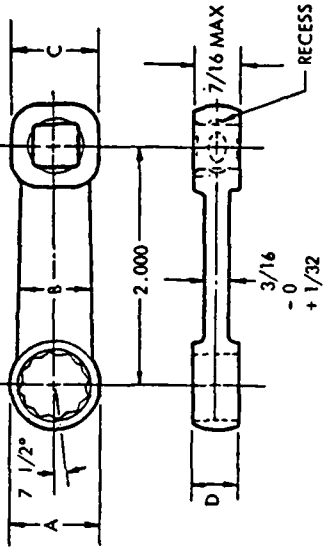


TYPE III, CLASS 1.

BOX WRENCH DIMENSIONS, 15-DEGREE OFFSET												
WRENCH OPENINGS DISTANCE ACROSS FLATS		OUTSIDE DIAMETER OF HEAD		PERMITTED ECCENTRICITY OF WRENCH OPENINGS TO OUTSIDE DIA. OF HEADS	THICKNESS OF HEADS		OVERALL LENGTH		MIN. TORQUE ENDURANCE (IN/LBS)		TEST LOAD	
A	B	C	D		E	F	G					
SMALL HEAD	LARGE HEAD	SMALL HEAD	LARGE HEAD		SMALL HEAD	LARGE HEAD						
INCH	INCH	MAX	MAX	MAX INCH	MAX INCH	MAX INCH	MIN INCH	MAX INCH	SMALL HEAD	LARGE HEAD	SMALL HEAD	LARGE HEAD
3/16	7/32	.296	.359	.010	.188	.203	5	8	50	60	150	180
3/16	1/4	.296	.400	.010	.188	.219	5	8	50	70	150	210
7/32	1/4	.359	.400	.010	.203	.219	5	8	60	70	180	210
7/32	9/32	.359	.421	.010	.203	.234	6	8	60	75	180	225
1/4	9/32	.400	.421	.010	.219	.234	6 1/2	8	70	75	210	225
1/4	5/16	.400	.470	.010	.219	.250	7	9	70	85	210	350
5/16	11/32	.470	.531	.010	.250	.281	7	9	85	105	350	375
5/16	3/8	.470	.581	.010	.250	.312	7	9	85	125	350	650
3/8	7/16	.581	.687	.010	.312	.343	7	9	125	250	650	1000
7/16	1/2	.687	.781	.010	.343	.359	8	10 1/8	250	400	1000	1400
1/2	9/16	.781	.875	.010	.359	.406	8 3/4	10 3/4	400	550	1400	1800
9/16	5/8	.875	.953	.010	.406	.468	9	11	550	750	1800	2400
5/8	3/4	.953	1.125	.015	.468	.531	10	12	750	1000	2400	3000
11/16	3/4	1.046	1.125	.015	.500	.531	10	12	750	1000	2400	3000
11/16	13/16	1.046	1.203	.015	.500	.562	10 3/4	12 3/4	750	1000	2400	3000

GGG-W-1437

FIGURE 5. BOX WRENCH, DOUBLE HEAD, 12 POINT, 15-DEGREE OFFSET, EACH END, HIGH STRENGTH, THIN WALL, REGULAR LENGTH.



TORQUE ADAPTER DIMENSIONS IN INCHES.

NOMINAL OPENING	OUTSIDE DIAMETER OF HEAD A	ECCENTRICITY OF WRENCH OPENINGS TO O.D. OF HEADS	HANDLE WIDTH B	DRIVE END WIDTH C	THICKNESS D	WEIGHT (OZ)	TEST LOAD (IN. LB.)
	MAX	MAX	MAX	MAX	MAX	MAX	MIN
5/16	.438	.015		3/4	.281	1-1/2	250
3/8	.580	.015		3/4	.312	1-1/2	650
7/16	.660	.015		3/4	.344	2	1000
1/2	.750	.015		3/4	.375	2	1400
9/16	.843	.015		3/4	.375	2	1800

FIGURE 6. TORQUE ADAPTER, 12 POINT, HIGH STRENGTH, THIN WALL, 3/8-INCH SQUARE DRIVE.

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Society of Automotive Engineers, Inc.
400 COMMONWEALTH DRIVE WARRENDALE PA 15096

AEROSPACE STANDARD

AS 954A

Issued 6-15-67
Revised 8-15-80

REVERSIBLE RATCHET HANDLES AND SOCKETS FLEXIBLE SOCKETS, BOX WRENCHES, TORQUE ADAPTERS, 12-POINT, HIGH STRENGTH, THIN WALL

1. SCOPE AND CLASSIFICATION

1.1 Scope: This Aerospace Standard (AS) covers reversible ratchet handles and high strength thin wall commercial sockets, flexible sockets, box wrenches and torque adapters designed for general usage which possess the strength, clearances, and an internal wrenching design so configured that, when mated with 12-point fasteners conforming to the requirement of AS 870, they shall transmit torque to the fastener without bearing on the outer 5% of the fastener's wrenching points.

1.2 Classification: This AS covers only a limited number of sizes and combinations of sizes of the aforementioned items for which an aerospace engine need has been demonstrated and for which the commercial item manufacturers can meet all requirements of this AS.

2. APPLICABLE DOCUMENTS

2.1 The following documents, of the issue in effect on the date of invitations for bids or request for proposal, form a part of this AS to the extent specified herein:

2.1.1 Federal Standards: Available from Commanding Officer Naval Publications and Forms Center, 5801 Tabor Avenue, Philadelphia, PA 19120.

FED-STD-346 - Gauges, Wrench Openings

2.2 Other Publications: The following documents form a part of this AS to the extent specified herein. Unless a specific issue is identified, the issue in effect on the date of invitation for bids or request for proposal shall apply:

2.2.1 American Society for Testing and Materials (ASTM) Standard: Available from American Society for Testing and Materials, 1916 Race Street, Philadelphia, PA 19103.

E18 - Rockwell Hardness and Rockwell Superficial Hardness of Metallic Materials, Standard Methods of Test For.

2.2.2 American National Standards Institute (ANSI), Inc., Standards: Available from American National Standards Institute, Inc., 1430 Broadway, New York, NY 10018.

B46.1 - Surface Texture.
B107.4 - Driving and Spindle Ends for Portable Hand, Air and Electric Tools.

2.2.3 SAE Publications: Available from Society of Automotive Engineers, Inc., 400 Commonwealth Drive, Warrendale, PA 15096.

AS 478 - Identification - Marking Methods
AS 870 - Wrenching Configuration, Double Hexagon (12-Point) for Threaded Fasteners

3. REQUIREMENTS

3.1 Illustrations: The illustrations shown herein are descriptive and not restrictive and are included for the convenience of requisitioning and purchasing officers and manufacturers, and are not intended to preclude the purchase of sockets, flexible sockets, box wrenches, torque adapters and reversible ratchet handles which are otherwise in accordance with this standard.

3.2 Materials: Unless otherwise specified hereinafter, the materials used in the manufacture of the sockets, flexible sockets, box wrenches, torque adapters and reversible ratchet handles shall be steel, the chemical composition and heat treatment of which shall be such as to produce tools conforming to the physical requirements specified herein.

3.3 Marking: The sockets, flexible sockets, box wrenches, torque adapters and reversible ratchet handles shall be marked in a permanent manner with the manufacturer's name, or with a trademark of such known character that the source of manufacture may be readily determined. In addition, the tools shall be marked in a permanent manner with the nominal wrench opening (except for reversible ratchet handles). Marking requirement shall be in accordance with AS 478.

3.4 Manufacture and Design:

3.4.1 Drive End Dimensions: Male and female drive and dimensions shall conform to ANSI B107.4.

3.4.1.1 Male Drive Tangs: Male drive tangs shall be designed for square drive. The drive tangs shall have a smooth machined engaging surface. Each male drive tang shall be provided with a spring-loaded steel ball permanently staked in place and arranged to hold the mating sockets and attachments. Each male drive tang shall be shouldered at the flats to provide a positive stop for the tang.

3.4.1.2 *Female Drive Opening:* All female drive openings shall be broached or punched in a smooth and well defined manner. Tools having female drive openings shall be firmly attachable to corresponding size male drive tangs by the following methods:

3.4.1.2.1 On 3/8 In. and Larger Drive Openings: One or more faces of the female drive opening shall be drilled or recessed so that any recess or drilled hole shall engage the spring-loaded steel ball on the corresponding male drive. If only one or two faces of the female opening are recessed, the sockets shall be marked indicating the face of the opening which is recessed.

3.4.1.2.2 On 1/4 In. Drive Openings: One or more faces of the female drive opening may or may not be drilled or recessed, however, the minimum force required to remove tang as specified in ANSI B107.4 shall be met.

3.4.2 Edges and Corners: All edges and corners, capable of causing injury, not otherwise covered herein, shall have sharp edges removed by rounding, chamfering, or other means. The inside edges of the wrench opening shall be chamfered.

3.4.3 Tang Engagement and Disengagement: The detachable sockets, flexible sockets, torque adapters and reversible ratchet handles shall be so designed that male tangs can be inserted into the corresponding female openings without undue force and shall be manually detachable without the use of any tools or keys, and meet the minimum force requirements to remove tang as specified in applicable tables of ANSI B107.4. Binding between surfaces and corners shall not be evident.

3.5 Hardness: Unless otherwise specified herein, sockets, flexible sockets, box wrenches, torque adapters and ratchet handles shall be hardened throughout to a Rockwell hardness of not less than 40 nor more than 54 on the "C" scale, except for ratchet drive tang which need not be hardened over more than the dimension "CM" as in Table X of ANSI B107.4. Hardness definitions, nomenclature and procedures used herein can be found in ASTM E18.

3.6 Finish:

3.6.1 Surface Roughness. All external surfaces shall be free from pits, nodules, forge flash, burrs, cracks, and other detrimental defects. The external forge flash shall be completely removed to blend smoothly with adjacent surfaces except that the forge flash shall be completely removed from the periphery of the heads of box wrenches and torque adapters and from that portion of the handle which shall be essentially straight and uniform in section dimensions. Maximum surface roughness values shall be determined by microinch values. Determination of microinch value shall be taken on a representative surface. Areas that are ground and buffed, or otherwise finished by an equivalent method, and provided with a coating finish of chromium shall have a uniform bright finish with a maximum roughness in microinches using a 0.030 in. roughness width cutoff on the surface measuring instrument, conforming to chart no. 1. Definitions and nomenclature used herein can be found in ANSI B46.1.

3.6.2 Coatings: The coatings shall be adherent, smooth, continuous and free from pits, blisters, nodules, and any other defects which would interfere with their protective value and serviceability. The maximum thickness of the coating shall be as specified in 3.6.2.1 on all external visible surfaces which can be touched by a ball 0.750 in. in diameter.

3.6.2.1 Chromium Plate: The coating shall be electrodeposited metals consisting of nickel, followed by chromium the minimum thickness of which shall be 0.0002 in. for nickel or iron-nickel and 0.00001 in. for chromium.

3.7 Test Loads: The items covered herein shall withstand the test load specified in the applicable tables without injury or permanent deformation (set) which might affect the durability or serviceability of the tools.

3.7.1 Mandrels for Wrench Openings: Wrench openings shall be tested on hexagonal mandrels. The size of all mandrels shall conform to the dimensions and tolerances specified in Table V. The OD of the hexagonal mandrel shall be reduced by 0.05H as shown on Fig. 1 to ensure that wrench lobe does not transmit torque on mandrel points. Mandrels shall be hardened to show a Rockwell hardness of not less than 55 on the "C" scale and shall have smoothly finished wrench engagement surfaces.

3.7.2 Test Plug:

3.7.2.1 Sockets: A square test plug of suitable strength and complying with the minimum dimensional requirements of the male drive tang specified in ANSI B107.4 shall be employed. The test plug may be driven by any suitable manual or mechanical means. The socket shall then be engaged on the end of a mandrel to a maximum depth in accordance with Table V. A stop may be set at the outer end of the test plug to prevent slippage of the socket end-wise from the mandrel.

3.7.2.2 Flexible Sockets: A test plug as in 3.7.3.1 shall be used except that a means shall be provided to keep flexible socket parts in the axes about which the load is applied.

3.7.3 Qualification Test:

3.7.3.1 Sockets, Flexible Sockets, Box Wrenches, Torque Adapters: Each sample tool tested shall be capable of withstanding 2000 applications of the minimum torque endurance load specified in the applicable table, and then the associated proof load when engaged per 3.7.1. After 250 applications on the mandrel, the tool shall be indexed 30 degrees.

3.7.3.2 Reversible Ratchet Handles: The ratchet mechanism shall withstand a cyclic test of 100,000 cycles, as specified in Table IV, without failure of the ratchet mechanism or loosening of screws or other parts of the handle. Following cyclic test, ratchet handle shall then be subjected to the proof load specified in Table IV and 3.12.2.

3.7.3.3 Integrity Test: One sample of each tool shall be loaded to failure. Failure shall not result in fragmentation.

3.8 Wrench Opening:

3.8.1 Wrenching Design: The internal wrench design of the socket, flexible socket, box wrench or torque adapter shall be so configured that, when mated with 12-point fasteners conforming to the requirements of AS 870, they shall transmit torque to the fastener without bearing on the outer 5% of the fastener's wrenching points. See Fig. 1.

3.8.2 Bolt and Nut End Opening Tolerance: Wrench opening tolerance shall be as specified in FED-STD-346.

3.9 Sockets: In addition to the requirements of 3.4, a bolt clearance hole shall be provided. The clearance hole length shall be from the base of the 12-point opening to the base of the square drive. The diameter of the bolt clearance hole shall conform to Table I.

3.10 Flexible Sockets: In addition to the requirements of 3.4, flexible sockets shall be provided with a friction type tension device which will hold the drive end and the socket end in any set position with a force adequate to hold the universal joint against gravity. Hinge pin shall be solid and not extended beyond the periphery of the universal joint. A thru bolt clearance hole shall be provided, the diameter of which shall be as specified in Table IA. The universal joint shall be capable of rotation in a complete arc when the angular deviation of either end member from the common center line is 40 degrees.

3.11 Box Wrenches, Torque Adapters:

3.11.1 Box Wrenches: The 15-degree and deep offset box wrenches shall be 12-point, double hexagon, double-head design and possess the wrenching design of 3.8.1.

3.11.2 Torque Adapters: Torque adapter shall be of the 12-point, double hexagon design with a 3/8 in. female square drive, and possess the wrenching design of 3.8.1. Two sides of square drive shall be parallel to line drawn from center of drive through center of nominal wrench openings.

3.12 Reversible Ratchet Handles: The reversible ratchet handles shall meet the unidirectional cyclic test torque of Table IV and 3.7.3.2, the drop test of 3.12.1, and the proof load test of Table IV and 3.12.2. The shifting lever, knob, or button shall be of sufficient strength to assure long life under hard usage and it shall be installed in such a manner that it can only be removed by a deliberate prying action. The ratchet handle shall withstand the test loads specified without permanent angular distortion of more than five degrees and shall show no indication of damage or adverse effect upon the ratcheting mechanism and the handle after removal of the test load. If an opening is provided for lubricating the ratchet mechanism, it shall be constructed in such a manner that dirt will not enter.

3.12.1 Drop Test: The reversible ratchet handle shall be dropped on a concrete floor from a height of six feet, a minimum of twelve times in random positions. However, the ratchet (button) mechanism shall strike (first) on the concrete floor at least twice. During this test, all components shall remain properly assembled and the ratchet mechanism shall work satisfactorily after the last drop has been completed.

3.12.2 Proof Load Test: The ratchet handles shall withstand the test loads specified without permanent angular distortion of more than five degrees and shall show no indication of damage or adverse effect on the ratcheting mechanism or the handle after removal of the test load.

3.13 Workmanship: All details of workmanship shall be in accordance with high grade commercial practices. All items covered herein shall be free from rust, fins, burrs, external sharp or rough edges, corners or surfaces and other defects which may impair their serviceability or durability.

CHART No. 1 - SPECIFIC AREAS OF FINISH

SOCKET FLEXIBLE SOCKET	Outer longitudinal surfaces or major diameter thereof shall be bright with 30 microinches maximum, except where knurled or grooved. The remaining exterior longitudinal socket surface shall be 150 microinches maximum.
BOX WRENCH TORQUE ADAPTER	A minimum of 180 degrees of the outer periphery of the box ends (90 degrees on each side of the longitudinal axis of the wrench) shall have a maximum roughness height value of 30 microinches (arithmetical average (A.A.))
REVERSIBLE RATCHET HANDLE	At least 180 degrees of the periphery of the head shall be bright with 30 microinches maximum. The remaining surfaces, except where knurled or grooved, shall be 150 microinches maximum.

Prepared By
SAE COMMITTEE EG-1
AEROSPACE PROPULSION SYSTEMS SUPPORT EQUIPMENT

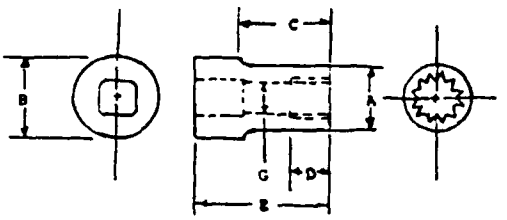
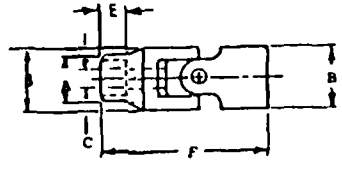


TABLE I - SOCKET DIMENSIONS (INCHES)

Nominal Wrench Opening	A Max	B Max	C Min	D Min Depth	E Min	E Max	G Dia Min	Min Torque Endurance Load (in-lb)	Proof Torque Load (in-lb)	Nom Square Drive Size
7/32	0.343	0.440	0.390	0.190	0.860	1.270	0.140	75	225	0.250
1/4	.380	.440	.390	.205	.860	1.270	.170	100	300	.250
9/32	.430	.440	.390	.215	.860	1.270	.180	125	375	.250
5/16	.478	.460	.390	.235	.860	1.270	.180	150	450	.250
3/8	.550	.697	.420	.270	.900	1.520	.281	300	900	.375
7/16	.680	.697	.420	.270	.900	1.520	.281	400	1250	.375
1/2	.730	.697	.420	.300	.900	1.750	.344	800	2400	.375
9/16	.812	.810	.420	.328	.900	1.780	.406	840	2500	.375
5/8	.892	.940	.734	.375	1.480	1.780	.480	1650	5000	.500
11/16	.960	.960	.840	.465	1.480	1.780	.480	1850	5500	.500
3/4	1.055	1.055	.840	.530	1.480	1.780	.531	2000	6000	.500

TABLE IA - FLEXIBLE SOCKET DIMENSIONS

SOCKET DIMENSIONS IN INCHES								
NOMINAL OPENING	SQUARE DRIVE SIZE	OVERALL LENGTH MAX F	OUTSIDE DIAMETER NUT END MAX A	OUTSIDE DIAMETER DRIVE END MAX B	DEPTH OPENING NUT END MIN E	BOLT CLEARANCE DIAMETER MIN C	TORQUE ENDURANCE LOAD (IN-LB) MIN	PROOF TORQUE LOAD (IN-LAB) MIN
1/4	0.250	1.312	0.385	0.515	0.205	0.203	100	300
5/16	.250	1.437	.470	.515	.235	.265	150	450
3/8	.250	1.500	.540	.515	.250	.281	180	550
7/16	.375	2.000	.660	.750	.281	.281	350	1000
1/2	.375	2.125	.740	.750	.328	.344	350	1000
9/16	.375	2.187	.800	.750	.375	.406	350	1000



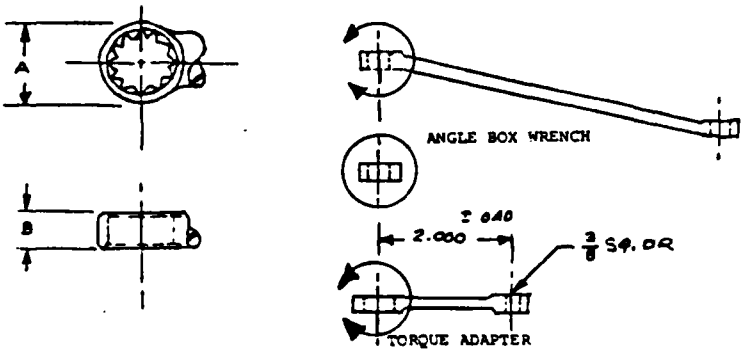


TABLE II - BOX WRENCH AND TORQUE ADAPTER DATA

Nominal Wrench Opening	A Max	B Max	Mini Torque Endurance Load (in-lb)	Proof Torque Load (in-lb)
7/32	0.375	0.250	60	180
1/4	.425	.250	70	220
9/32	.445	.250	85	250
5/16	.480	.266	90	275
3/8	.578	.327	200	605
7/16	.660	.349	250	750
1/2	.750	.359	400	1200
9/16	.830	.406	550	1650
5/8	.920	.468	750	2200
11/16	1.010	.490	880	2640
3/4	1.090	.531	1000	3000

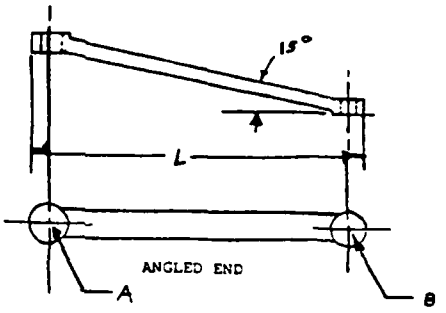


TABLE III - ANGLED END BOX WRENCH

WRENCH OPENING			
SMALL END 'A'	LARGE END 'B'	L MIN	L MAX
7/32	1/4	5	8
5/16	3/8	7	9
7/16	1/2	8	10 1/8
9/16	5/8	9	11
11/16	3/4	10	12

TABLE IV Reversible ratchet handle dimensions

Square drive	Overall length	Head dimensions			Hand grip diameter or width	Gear head number of teeth in gear	Horizontal or sliding movement of gear in housing	*Vertical or* up and down movement of gear in housing	*Reverse* torque ratcheting starting	*Proof* Load Torque Min	*Cycle* Tes- Torque
		Width	Head thickness less tang	Head thickness housing only							
Inch	Min Max inches	Max inches	Max inch	Max inch	Min inch	Min inch	Max inch	Max inch	Max in/ozs	Min in/lbs	
1/4	5 5 1/2	1-1/8	9/16	1/2	3/8	20	0.010	0.015	8	600	90
3/8	7 8	1-13/16	7/8	5/8	1/2	20	0.010	0.015	16	1,800	250
1/2	10 11	1-15/16	1	13/16	5/8	30	0.010	0.015	35	4,500	670

TABLE V - HEXAGON MANDREL ENGAGEMENT DIMENSIONS

For Wrench Sizes	Nominal Wrench Opening	Hexagon mandrel Across flats Tolerances	Mandrel Engagement Maximum depth of Insertion
7/32	0.2188	+.001 - .002	0.109
1/4	.2500	+.001 - .002	.125
9/32	.2812	+.001 - .002	.141
5/16	.3125	+.001 - .002	.141
3/8	.3750	+.001 - .002	.156
7/16	.4375	+.001 - .002	.218
1/2	.5000	+.001 - .003	.265
9/16	.5625	+.001 - .003	.328
5/8	.6250	+.001 - .003	.375
11/16	.6875	+.001 - .003	.375
3/4	.7500	+.001 - .003	.437

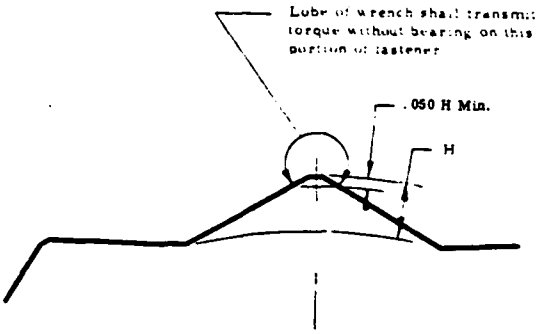


FIGURE 1 - INTERNAL WRENCH ENGAGEMENT

APPENDIX C

POPULATION BASES

WARRANTED TOOL PROGRAM
PARTICIPATING BASES

BASE LOCATION

Altus AFB, Altus OK

Alvin Callendar Field, New Orleans LA

Andrews AFB, Washington D.C.

Bangor IAP, Bangor ME

Barksdale AFB, Bossier City LA

Barnes Municipal Airport, Westfield MA

Battle Creek ANG-Base MI

Beale AFB, Marysville CA

Bergstrom AFB, Austin TX

Birmingham Municipal Airport AL

Blytheville AFB, Blytheville AR

Boise Air Terminal ID

Bradley IAP, East Gramby CT

Buckley ANG-Base CO

Burlington IAP VT

Byrd Field, Sanston VA

Cannon AFB, Clovis NM

Cannon IAP, May ANG-Base, Reno NV

Capital Airport, Springfield IL

Carswell AFB, Fort Worth TX

Castle AFB, Merced CA

Charleston AFB, North Charleston SC

Cheyenne Municipal Airport, Cheyenne WY

Columbus AFB, Columbus MS

Dannelly Field, Montgomery AL

Davis-Monthan AFB, Tucson AZ

Des Moines Municipal Airport IA

Dobbins AFB, Marietta GA

Douglas Municipal Airport, Charlotte NC

Dover AFB, Dover DE

Duluth International Airport, Duluth MN

Dyess AFB, Abilene TX

East West VA Regional Airport, Martinsburg WV

Eging ANG-Base, Fort Smith AR

Edwards AFB CA

Eglin AFB, Valparasio FL

Eielson AFB, Fairbanks AK

Ellington AFB, Houston TX

Ellsworth AFB, Rapid City SD

Elmendorf AFB, Anchorage AK

England AFB, Alexandria LA

Fairchild AFB, Spokane WA

Forbes Field ANG-Base KS

Fort Wayne Municipal Airport IN

Fresno Air Terminal CA

Gen. B. Mitchell Field, Milwaukee WI

George AFB, Victorville CA

Glenn L. Martin State Airport, Baltimore MD

Grand Forks AFB, Grand Forks ND

Great Falls IAP MT

Greater Pittsburgh IAP PA

Greater Wilminton Airport, New Castle DE

Griffiss AFB, Rome NY

Grissom AFB, Peru IN

Hancock Field, Syracuse NY

Harrisburg IAP PA

Hector Field, Fargo ND

Hensley Field, Dallas TX

Hickam AFB, Honolulu HI

Hill AFB, Ogden UT

Holloman AFB, Alamogordo NM

Homestead AFB, Homestead FL

Hulman Field, Terre Haute IN

Hurlburt Field, Fort Walton Beach FL

Jackson Municipal Airport MS

Jackson IAP FL

Joe Foss Field, Sioux Falls SD

Kanawha Airport, Charleston WV

Keesler AFB, Biloxi MS

Kelly AFB, San Antonio TX

Key Field, Meridian MS

Kirtland AFB, Albuquerque NM

K. I. Sawyer AFB, Marquette MI

Kulis ANG-Base, Anchorage IAP AK

Langley AFB, Hampton VA

Laughlin AFB, Del Rio TX

Lincoln Municipal Airport NE

Little Rock AFB, Little Rock AR

Loring AFB, Limestone ME

Luke AFB, Phoenix AZ

MacDill AFB, Tampa FL

Mansfield Lahm Airport, Mansfield OH

March AFB, Riverside CA

Mather AFB, Sacramento CA

Maxwell AFB, Montgomery AL

McChord AFB, Tacoma WA

McClellan AFB, Sacramento CA

McConnell AFB, Wichita KA

MeEntire ANG-Base, Columbia SC

McGhee Tyson Airport, Knoxville TN

McGuire AFB, Trenton NJ

Memphis IAP TN

Minneapolis-St Paul IAP MN

Minot AFB, Minot ND

Moffett Naval Air Station, Mountain View CA

Moody AFB, Valdosta GA

Mountain Home AFB, Mountain Home ID

Myrtle Beach AFB, Myrtle Beach SC

National Aviation Facilities Experimental Center, Atlantic City NJ

Nashville Metropolitan Airport TN

Nellis AFB, Las Vegas NV

New Orleans NAS, New Orleans LA

Niagara Falls International Airport, Niagara Falls NY

Norton AFB, San Bernadino CA

Offutt AFB, Omaha NE

O'Hare International Airport, Chicago IL

Ontario IAP CA

Otis AFB, Falmouth MA

Patrick AFB, Cocoa Beach FL

Pease AFB, Portsmouth NH

Peoria Airport IL

Peterson Field, Colorado Springs CO

Plattsburgh AFB, Plattsburgh NY

Pope AFB, Fayetteville NC

Portland IAP, Portland OR

Quonset State Airport, North Kingstown RI

Randolph AFB, San Antonio TX

Reese AFB, Lubbock TX

Richards-Gebaur AFB, Kansas City MO

Rickenbacker AFB, Columbus OH

Robins AFB, Warner Robins GA

Rosecrans Memorial Airport, St Joseph MO

Salt Lake City IAP UT

Savannah Municipal Airport GA

Schenectady County Airport NY

Scott AFB, Belleville IL

Selfridge ANGB, Mount Clemens MI

Seymour-Johnson AFB, Goldsboro NC

Shaw AFB, Sumter SC

Sheppard AFB, Wichita Falls TX

Sioux City Municipal Airport IA

Sky Harbor IAP, Phoenix AZ

Springfield Municipal Airport OH

Standiford Field, Louisville KY

St Louis IAP MO

Suffolk County Airport, Westhampton Beach NY

Tinker AFB, Oklahoma City OK

Toledo Express Airport OH

Travis AFB, Fairfield CA

Truax Field, Madison WI

Tucson IAP AZ

Tulsa IAP OK

Tyndall AFB, Panama City FL

Vance AFB, Enid OK

Van Nuys ANG-Base CA

Volk Field ANG-Base, Madison WI

Westchester County Airport, White Plains NY

Westover AFB, Chicopee Falls MA

Williams AFB, Mesa AZ

Willow Grove Naval Air Station, Philadelphia PA

Will Rogers World Airport, Oklahoma City OK

Wright-Patterson AFB, Dayton OH

Wurthsmith AFB, Oscoda MI

Youngstown Municipal Airport, Youngstown OH

APPENDIX D

AFLMC SAMPLE BASES

Base (Total = 16)	Number of Surveys Sent (Total = 623)
28 BMW/MA Ellsworth AFB SD 57706	43
37 TFW/MA George AFB CA 92392	80
438 MAW/MA McGuire AFB NJ 08641	58
437 MAW/MA Charleston AFB SC 29405	75
113 TFW/MA Andrews AFB Washington D.C. 20334	16
87 FIS/MA K. I. Sawyer AFB MI 49843	23
148 TFW/MA Duluth International Airport Duluth MN 55811	15
93 BMW/MA and 84 FIS/MA Castle AFB CA 95342	65 + 21 = 86
19 BMW/MA Robbins AFB GA	15
4 TFW/MA Seymour-Johnson AFB NC 27531	47
63 MAG/MA Norton AFB CA 92409	80
5 BMW/MA Minot AFB ND 58705	20
379 BMW/MA Wurtsmith AFB MI 48753	22
347 TFW/MA Moody AFB GA 31699	30

Base	Number of Surveys Sent (Total = 623)
97 BMW/MA Blytheville AFB AR 72315	13 (not returned)
319 BMW/MA Grand Forks AFB ND 58201	17

APPENDIX E

NORTH/SOUTH LISTING

Bases

Cut Off Pt. = 38° N Latitude

North	South
Ellsworth SD	George CA
McGuire NJ	Charleston SC
K. I. Sawyer MI	Andrews DC
Duluth MN	Robins GA
Minot ND	Seymour-Johnson NC
Wurtsmith MI	Norton CA
Grand Forks ND	Moody GA

APPENDIX F

TELEPHONE SURVEY SAMPLE BASES

Base, State	Command
Little Rock AFB AR	MAC
O'Hare International Airport IL	AFRES
Minot AFB ND	SAC
Kirtland AFB NM	MAC
Luke AFB AZ	TAC
Beale AFB CA	SAC
March AFB CA	SAC
Norton AFB CA	MAC
Dyess AFB TX	MAC
Battle Creek MI	ANG
Holloman AFB NM	TAC
Travis AFB CA	MAC
Barnes Municipal Airport MA	ANG
Dobbins AFB GA	AFRES
Niagara Falls International NY	AFRES
Hancock Field NY	ANG
Wright-Patterson AFB OH	AFRES
Myrtle Beach AFB SC	TAC
Capital Airport IL	ANG
Jackson Municipal Airport MS	ANG
Bergstrom AFB TX	TAC
Sheppard AFB TX	ATC
Will Rogers World Airport OK	ANG
McChord AFB WA	MAC
Langley AFB VA	TAC

APPENDIX G

AFLMC SURVEY

DEPARTMENT OF THE AIR FORCE
AIR FORCE LOGISTICS MANAGEMENT CENTER
GUNTER AIR FORCE STATION, AL 36114

REPLY TO ATTN OF: LGM

SUBJECT: Survey on Warranted Hand Tools (Survey Control No. USAF SCN 83-3)

TO: SURVEY PARTICIPANTS

1. The AFLMC is involved in evaluating the effectiveness of the Warranted Hand Tool Program in aircraft maintenance Propulsion Branches.

2. In order for us to effectively evaluate this program, we are enclosing a survey and solicit your views and opinions. Participation in the survey is strictly voluntary and no attempt will be made to attribute the answers to specific respondents. We would appreciate receiving your reply NLT 1 Mar 83.

MILTON L. FELTCH, Lt Col, USAF
Director of Maintenance

3 Atchs
1. Privacy Act Statement
2. Survey Instructions
3. Survey Instrument

Atch 1 deleted from Appendix G

SURVEY INSTRUCTIONS

1. Do not write your name or social security number on the answer sheet.

2. Select the single best answer to each question by circling the number above the answer that best reflects your opinion.

3. Upon completion, please return the survey in the envelope provided to the Air Force Logistics Management Center/LGM, Gunter AFS, AL 36114.

4. Please complete and return the surveys by 15 Feb 83. Replies after this date will not be included in the analysis.

5. Thank you for your time and cooperation.

1. To what MAJCOM or organization are you assigned?

1	2	3	4	5	6
SAC	MAC	TAC	ANG	AFRES	ADTAC

2. What is your military rank? _____

3. How many years of engine maintenance experience do you have? _____

4. Are you using the Warranted tools? YES NO

5. What is your opinion of the quality of handtools provided to engine mechanics in the past?

1	2	3	4	5	6
Very Poor	Marginal	Acceptable	Good	Excellent	Not Applicable or No Opinion

6. What is your opinion of the quality of the SNAP-ON hand tools now being provided?

1	2	3	4	5	6
Very Poor	Marginal	Acceptable	Good	Excellent	Not Applicable or No Opinion

7. What is your opinion of the quality of needle nose pliers that were provided to engine mechanics in the past?

1	2	3	4	5	6
Very Poor	Marginal	Acceptable	Good	Excellent	Not Applicable or No Opinion

8. What is your opinion of the quality of the Diamond Tool Company needle nose pliers now being provided?

1	2	3	4	5	6
Very Poor	Marginal	Acceptable	Good	Excellent	Not Applicable or No Opinion

9. What is your opinion of the quality of the diagonal cutting pliers that were provided to engine mechanics in the past?

1	2	3	4	5	6
Very Poor	Marginal	Acceptable	Good	Excellent	Not Applicable or No Opinion

10. What is your opinion of the quality of the Diamond Tool Company diagonal cutting pliers now being provided?

1	2	3	4	5	6
Very Poor	Marginal	Acceptable	Good	Excellent	Not Applicable or No Opinion

11. What is your opinion of the quality of the screw drivers provided to engine mechanics in the past?

1	2	3	4	5	6
Very Poor	Marginal	Acceptable	Good	Excellent	Not Applicable or No Opinion

12. What is your opinion of the quality of the Stanley Screwdrivers now being provided?

1	2	3	4	5	6
Very Poor	Marginal	Acceptable	Good	Excellent	Not Applicable or No Opinion

13. The quality of hand tools provided in the past created frustration among engine mechanics I have worked with.

1	2	3	4	5	6
Strongly disagree	Disagree	Undecided	Agree	Strongly agree	Not Applicable or No Opinion

14. The introduction of warranted tools has improved engine mechanics attitudes.

1	2	3	4	5	6
Strongly disagree	Disagree	Undecided	Agree	Strongly agree	Not Applicable or No Opinion

15. I have been disatisfied with the quality of hand tools provided to me in the past.

1	2	3	4	5	6
Strongly disagree	Disagree	Undecided	Agree	Strongly agree	Not Applicable or No Opinion

16. The introduction of warranted tools has reduced my frustrations with tools.

1	2	3	4	5	6
Strongly disagree	Disagree	Undecided	Agree	Strongly agree	Not Applicable or No Opinion

Other Comments?

Thank you for your views. Your answers will be used in evaluating the effectiveness of the Warranted Hand Tool Program. Please return your answer in the envelope provided to the Air Force Logistics Management Center/LGM, Gunter AFS, AL 36114.

APPENDIX H

TELEPHONE QUESTIONNAIRE

BASE

NUMBER OF ASSIGN TECHNICIAN

RANK

YEARS EXPERIENCE

---

1. Which tools are the warranted tools?

2. How can you tell?

3. What would you consider makes a quality hand tool?

4. How would you compare the performance of the tools in the past with the warranted tools?

5. What did you like about the tools in the past?

6. What do you like about the warranted tools?

7. Has any tool broken while you were using it? If Yes, answer the following questions:

   a. Was it warranted or nonwarranted?

   b. What is your opinion of the broken tool exchange process in the past?

   c. What is your opinion of the broken tool exchange process with the Warranted Tool Program?

   d. Have you ever filled out a QDR/MDR/UR for a broken hand tool?

   e. How would you describe the response you received from the report?

   f. Have you been satisfied with the tools supplied as replacements?

   g. If not, why not.

8. In your opinion:

   Has safety improved with the warranted tools?

   Has there been a decrease in FOD?

   Has production (work output) increased?

   Has there been a decrease in damage to equipment?

9. What improvements would you make to the warranted tools?

10. What is your overall opinion of the Warranted Tool Program?

11. What is your favorite brand of hand tool?

APPENDIX I

COMPUTER PRINTOUTS

CROSSTABULATION

```
RUN NAME        CROSTAB
VARIABLE LIST   BASE,CMD,RANK,YREXP,WTOOL
                Q5,Q6,Q7,Q8,Q9,Q10,Q11
                Q12,Q13,Q14,Q15,Q16
INPUT FORMAT    FREEFIELD
RECODE          CMD('A'=1)('B'=2)('C'=3)('D'=4)('E'=5)('F'=6)/
                RANK('E1'=1)('E2'=2)('E3'=3)('E4'=4)('E5'=5)('E6'=6)
                ('E7'=7)('E8'=8)('E9'=9)(ELSE=0)
                YREXP(1 THRU 24=1)(25 THRU 84=2)
                (85 THRU 144=3)(145 THRU HIGHEST=4)/
                WTOOL('A'=1)('B'=2)(ELSE=0)/
                Q5 TO Q16 ('A'=1)('B'=2)('C'=3)('D'=4)('E'=5)(ELSE=0)
                BASE(1 THRU 43,107 THRU 164,256 THRU 293,
                501 THRU 542,586 THRU 602=1)
                (44 THRU 106,165 THRU 255,294 THRU 500,
                543 THRU 572,603 THRU 623,999=2)

      .090 SECONDS


CROSSTABS       TABLES=CMD BY Q5 TO Q16
```

CMD	Q5 0	1.	2.	3.	4.	5.	ROW TOTAL
1.	3	39	49	55	22	6	174
	1.7	22.4	28.2	31.6	12.6	3.4	33.3
	60.0	32.2	33.3	35.5	27.2	42.9	
	.6	7.5	9.4	10.5	4.2	1.1	
2.	1	55	54	55	31	3	199
	.5	27.6	27.1	27.6	15.6	1.5	38.0
	20.0	45.5	36.7	35.5	38.3	21.4	
	.2	10.5	10.3	10.5	5.9	.6	
3.	1	20	35	37	26	4	123
	.8	16.3	28.5	30.1	21.1	3.3	23.5
	20.0	16.5	23.8	23.9	32.1	28.6	
	.2	3.8	6.7	7.1	5.0	.8	
4.	0	4	2	7	0	1	14
	0	28.6	14.3	50.0	0	7.1	2.7
	0	3.3	1.4	4.5	0	7.1	
	0	.8	.4	1.3	0	.2	
5.	0	1	1	0	0	0	2
	0	50.0	50.0	0	0	0	.4
	0	.8	.7	0	0	0	
	0	.2	.2	0	0	0	
6.	0	2	6	1	2	0	11
	0	18.2	54.5	9.1	18.2	0	2.1
	0	1.7	4.1	.6	2.5	0	
	0	.4	1.1	.2	.4	0	
COLUMN TOTAL	5	121	147	155	81	14	523
	1.0	23.1	28.1	29.6	15.5	2.7	100.0

CMD	Q6 0	1.	2.	3.	4.	5.	ROW TOTAL
1.	1	1	3	16	81	72	174
	.6	.6	1.7	9.2	46.6	41.4	33.3
	33.3	33.3	27.3	27.1	39.7	29.6	
	.2	.2	.6	3.1	15.5	13.8	
2.	2	2	5	29	62	99	199
	1.0	1.0	2.5	14.6	31.2	49.7	38.0
	66.7	66.7	45.5	49.2	30.4	40.7	
	.4	.4	1.0	5.5	11.9	18.9	
3.	0	0	2	14	50	57	123
	0	0	1.6	11.4	40.7	46.3	23.5
	0	0	18.2	23.7	24.5	23.5	
	0	0	.4	2.7	9.6	10.9	
4.	0	0	1	0	8	5	14
	0	0	7.1	0	57.1	35.7	2.7
	0	0	9.1	0	3.9	2.1	
	0	0	.2	0	1.5	1.0	
5.	0	0	0	0	1	1	2
	0	0	0	0	50.0	50.0	.4
	0	0	0	0	.5	.4	
	0	0	0	0	.2	.2	
6.	0	0	0	0	2	9	11
	0	0	0	0	18.2	81.8	2.1
	0	0	0	0	1.0	3.7	
	0	0	0	0	.4	1.7	
COLUMN TOTAL	3	3	11	59	204	243	523
	.6	.6	2.1	11.3	39.0	46.5	100.0

Q7

CMD	COUNT / ROW PCT / COL PCT / TOT PCT	0	1	2	3	4	5	ROW TOTAL
1.		5	22	50	62	31	4	174
		2.9	12.6	28.7	35.6	17.8	2.3	33.3
		45.5	27.2	37.0	36.0	29.8	20.0	
		1.0	4.2	9.6	11.9	5.9	.8	
2.		1	39	48	66	41	4	199
		.5	19.6	24.1	33.2	20.6	2.0	38.0
		9.1	48.1	35.6	38.4	39.4	20.0	
		.2	7.5	9.2	12.6	7.8	.8	
3.		3	17	26	37	28	12	123
		2.4	13.8	21.1	30.1	22.8	9.8	23.5
		27.3	21.0	19.3	21.5	26.9	60.0	
		.6	3.3	5.0	7.1	5.4	2.3	
4.		1	2	5	5	1	0	14
		7.1	14.3	35.7	35.7	7.1	0	2.7
		9.1	2.5	3.7	2.9	1.0	0	
		.2	.4	1.0	1.0	.2	0	
5.		0	0	1	0	1	0	2
		0	0	50.0	0	50.0	0	.4
		0	0	.7	0	1.0	0	
		0	0	.2	0	.2	0	
6.		1	1	5	2	2	0	11
		9.1	9.1	45.5	18.2	18.2	0	2.1
		9.1	1.2	3.7	1.2	1.9	0	
		.2	.2	1.0	.4	.4	0	
COLUMN TOTAL		11 2.1	81 15.5	135 25.8	172 32.9	104 19.9	20 3.8	523 100.0

Q8

CMD	COUNT / ROW PCT / COL PCT / TOT PCT	0	1	2	3	4	5	ROW TOTAL
1.		69	6	13	26	47	13	174
		39.7	3.4	7.5	14.9	27.0	7.5	33.3
		23.3	24.0	54.2	54.2	50.5	35.1	
		13.2	1.1	2.5	5.0	9.0	2.5	
2.		172	0	1	3	10	13	199
		86.4	0	.5	1.5	5.0	6.5	38.0
		58.1	0	4.2	6.3	10.8	35.1	
		32.9	0	.2	.6	1.9	2.5	
3.		44	19	10	18	24	8	123
		35.8	15.4	8.1	14.6	19.5	6.5	23.5
		14.9	76.0	41.7	37.5	25.8	21.6	
		8.4	3.6	1.9	3.4	4.6	1.5	
4.		4	0	0	1	9	0	14
		28.6	0	0	7.1	64.3	0	2.7
		1.4	0	0	2.1	9.7	0	
		.8	0	0	.2	1.7	0	
5.		2	0	0	0	0	0	2
		100.0	0	0	0	0	0	.4
		.7	0	0	0	0	0	
		.4	0	0	0	0	0	
6.		5	0	0	0	3	3	11
		45.5	0	0	0	27.3	27.3	2.1
		1.7	0	0	0	3.2	8.1	
		1.0	0	0	0	.6	.6	
COLUMN TOTAL		296 56.6	25 4.8	24 4.6	48 9.2	93 17.8	37 7.1	523 100.0

Q9

CMD	COUNT / ROW PCT / COL PCT / TOT PCT	0	1	2	3	4	5	ROW TOTAL
1.		7	28	32	61	36	10	174
		4.0	16.1	18.4	35.1	20.7	5.7	33.3
		38.9	36.8	34.0	35.5	25.2	40.0	
		1.3	5.4	6.1	11.7	6.9	1.9	
2.		8	35	35	58	54	9	199
		4.0	17.6	17.6	29.1	27.1	4.5	38.0
		44.4	46.1	39.3	33.7	37.8	36.0	
		1.5	6.7	6.7	11.1	10.3	1.7	
3.		3	9	18	45	42	6	123
		2.4	7.3	14.6	36.6	34.1	4.9	23.5
		16.7	11.8	20.2	26.2	29.4	24.0	
		.6	1.7	3.4	8.6	8.0	1.1	
4.		0	3	0	5	6	0	14
		0	21.4	0	35.7	42.9	0	2.7
		0	3.9	0	2.9	4.2	0	
		0	.6	0	1.0	1.1	0	
5.		0	0	1	0	1	0	2
		0	0	50.0	0	50.0	0	.4
		0	0	1.1	0	.7	0	
		0	0	.2	0	.2	0	
6.		0	1	3	3	4	0	11
		0	9.1	27.3	27.3	36.4	0	2.1
		0	1.3	3.4	1.7	2.8	0	
		0	.2	.6	.6	.8	0	
COLUMN TOTAL		18 3.4	76 14.5	89 17.0	172 32.9	143 27.3	25 4.8	523 100.0

Q10

CMD	COUNT / ROW PCT / COL PCT / TOT PCT	0	1	2	3	4	5	ROW TOTAL
1.		68	2	6	22	48	28	174
		39.1	1.1	3.4	12.6	27.6	16.1	33.3
		22.0	25.0	66.7	55.0	47.5	50.0	
		13.0	.4	1.1	4.2	9.2	5.4	
2.		183	0	0	2	10	4	199
		92.0	0	0	1.0	5.0	2.0	38.0
		59.2	0	0	5.0	9.9	7.1	
		35.0	0	0	.4	1.9	.8	
3.		46	6	3	15	34	19	123
		37.4	4.9	2.4	12.2	27.6	15.4	23.5
		14.9	75.0	33.3	37.5	33.7	33.9	
		8.8	1.1	.6	2.9	6.5	3.6	
4.		5	0	0	1	7	1	14
		35.7	0	0	7.1	50.0	7.1	2.7
		1.6	0	0	2.5	6.9	1.8	
		1.0	0	0	.2	1.3	.2	
5.		2	0	0	0	0	0	2
		100.0	0	0	0	0	0	.4
		.6	0	0	0	0	0	
		.4	0	0	0	0	0	
6.		5	0	0	0	2	4	11
		45.5	0	0	0	18.2	36.4	2.1
		1.6	0	0	0	2.0	7.1	
		1.0	0	0	0	.4	.8	
COLUMN TOTAL		309 59.1	8 1.5	9 1.7	40 7.6	101 19.3	56 10.7	523 100.0

Q11

CMD	COUNT / ROW PCT / COL PCT / TOT PCT	0	1	2	3	4	5	ROW TOTAL
1.		7	20	28	71	15	3	124
		4.0	11.5	16.1	40.8	25.9	1.7	33.3
		58.3	27.4	28.6	35.9	34.4	27.3	
		1.3	3.8	5.4	13.6	8.6	.6	
2.		3	39	47	70	37	3	199
		1.5	19.6	23.6	35.2	18.6	1.5	38.0
		25.0	53.4	48.0	35.4	28.2	27.3	
		.6	7.5	9.0	13.4	7.1	.6	
3.		2	9	15	48	44	5	123
		1.6	7.3	12.2	39.0	35.8	4.1	23.5
		16.7	12.3	15.3	24.2	33.6	45.5	
		.4	1.7	2.9	9.2	8.4	1.0	
4.		0	3	3	7	1	0	14
		0	21.4	21.4	50.0	7.1	0	2.7
		0	4.1	3.1	3.5	.8	0	
		0	.6	.6	1.3	.2	0	
5.		0	0	0	1	1	0	2
		0	0	0	50.0	50.0	0	.4
		0	0	0	.5	.8	0	
		0	0	0	.2	.2	0	
6.		0	2	5	1	3	0	11
		0	18.2	45.5	9.1	27.3	0	2.1
		0	2.7	5.1	.5	2.3	0	
		0	.4	1.0	.2	.6	0	
COLUMN TOTAL		12 2.3	73 14.0	98 18.7	198 37.9	131 25.0	11 2.1	523 100.0

Q12

CMD	COUNT / ROW PCT / COL PCT / TOT PCT	0	1	2	3	4	5	ROW TOTAL
1.		64	1	6	10	60	33	124
		36.8	.6	3.4	5.7	34.5	19.0	33.3
		21.5	25.0	85.7	31.3	49.2	55.0	
		12.2	.2	1.1	1.9	11.5	6.3	
2.		176	2	1	7	9	4	199
		88.4	1.0	.5	3.5	4.5	2.0	38.0
		59.1	50.0	14.3	21.9	7.4	6.7	
		33.7	.4	.2	1.3	1.7	.8	
3.		45	1	0	15	44	18	123
		36.6	.8	0	12.2	35.8	14.6	23.5
		15.1	25.0	0	46.9	36.1	30.0	
		8.6	.2	0	2.9	8.4	3.4	
4.		6	0	0	0	8	0	14
		42.9	0	0	0	57.1	0	2.7
		2.0	0	0	0	6.6	0	
		1.1	0	0	0	1.5	0	
5.		2	0	0	0	0	0	2
		100.0	0	0	0	0	0	.4
		.7	0	0	0	0	0	
		.4	0	0	0	0	0	
6.		5	0	0	0	1	5	11
		45.5	0	0	0	9.1	45.5	2.1
		1.7	0	0	0	.8	8.3	
		1.0	0	0	0	.2	1.0	
COLUMN TOTAL		298 57.0	4 .8	7 1.3	32 6.1	122 23.3	60 11.5	523 100.0

Q13

CMD		0	1	2	3	4	5	ROW TOTAL
1.	COUNT	8	6	12	15	84	49	174
	ROW PCT	4.6	3.4	6.9	8.6	48.3	28.2	33.3
	COL PCT	42.1	46.2	23.1	35.7	36.1	29.9	
	TOT PCT	1.5	1.1	2.3	2.9	16.1	9.4	
2.	COUNT	5	5	22	10	91	66	199
	ROW PCT	2.5	2.5	11.1	5.0	45.7	33.2	38.0
	COL PCT	26.3	38.5	42.3	23.8	39.1	40.2	
	TOT PCT	1.0	1.0	4.2	1.9	17.4	12.6	
3.	COUNT	6	1	18	14	46	38	123
	ROW PCT	4.9	.8	14.6	11.4	37.4	30.9	23.5
	COL PCT	31.6	7.7	34.6	33.3	19.7	23.2	
	TOT PCT	1.1	.2	3.4	2.7	8.8	7.3	
4.	COUNT	0	1	0	1	9	3	14
	ROW PCT	0	7.1	0	7.1	64.3	21.4	2.7
	COL PCT	0	7.7	0	2.4	3.9	1.8	
	TOT PCT	0	.2	0	.2	1.7	.6	
5.	COUNT	0	0	0	0	1	1	2
	ROW PCT	0	0	0	0	50.0	50.0	.4
	COL PCT	0	0	0	0	.4	.6	
	TOT PCT	0	0	0	0	.2	.2	
6.	COUNT	0	0	0	2	2	7	11
	ROW PCT	0	0	0	18.2	18.2	63.6	2.1
	COL PCT	0	0	0	4.8	.9	4.3	
	TOT PCT	0	0	0	.4	.4	1.3	
COLUMN TOTAL		19	13	52	42	233	164	523
		3.6	2.5	9.9	8.0	44.6	31.4	100.0

Q14

CMD		0	1	2	3	4	5	ROW TOTAL
1.	COUNT	5	2	24	52	75	16	174
	ROW PCT	2.9	1.1	13.8	29.9	43.1	9.2	33.3
	COL PCT	25.0	16.7	37.5	48.6	31.1	20.3	
	TOT PCT	1.0	.4	4.6	9.9	14.3	3.1	
2.	COUNT	9	5	23	36	87	39	199
	ROW PCT	4.5	2.5	11.6	18.1	43.7	19.6	38.0
	COL PCT	45.0	41.7	35.9	33.6	36.1	49.4	
	TOT PCT	1.7	1.0	4.4	6.9	16.6	7.5	
3.	COUNT	6	5	15	16	63	18	123
	ROW PCT	4.9	4.1	12.2	13.0	51.2	14.6	23.5
	COL PCT	30.0	41.7	23.4	15.0	26.1	22.8	
	TOT PCT	1.1	1.0	2.9	3.1	12.0	3.4	
4.	COUNT	0	0	1	1	9	3	14
	ROW PCT	0	0	7.1	7.1	64.3	21.4	2.7
	COL PCT	0	0	1.6	.9	3.7	3.8	
	TOT PCT	0	0	.2	.2	1.7	.6	
5.	COUNT	0	0	1	0	1	0	2
	ROW PCT	0	0	50.0	0	50.0	0	.4
	COL PCT	0	0	1.6	0	.4	0	
	TOT PCT	0	0	.2	0	.2	0	
6.	COUNT	0	0	0	2	6	3	11
	ROW PCT	0	0	0	18.2	54.5	27.3	2.1
	COL PCT	0	0	0	1.9	2.5	3.8	
	TOT PCT	0	0	0	.4	1.1	.6	
COLUMN TOTAL		20	12	64	107	241	79	523
		3.8	2.3	12.2	20.5	46.1	15.1	100.0

Q15

CMD	COUNT / ROW PCT / COL PCT / TOT PCT	0	1	2	3	4	5	ROW TOTAL
1.		5	1	21	24	80	43	174
		2.9	.6	12.1	13.8	46.0	24.7	33.3
		33.3	25.0	28.8	38.1	34.9	30.9	
		1.0	.2	4.0	4.6	15.3	8.2	
2.		4	1	24	21	87	62	199
		2.0	.5	12.1	10.6	43.7	31.2	38.0
		26.7	25.0	32.9	33.3	38.0	44.6	
		.8	.2	4.6	4.0	16.6	11.9	
3.		5	2	27	14	49	26	123
		4.1	1.6	22.0	11.4	39.8	21.1	23.5
		33.3	50.0	37.0	22.2	21.4	18.7	
		1.0	.4	5.2	2.7	9.4	5.0	
4.		1	0	1	1	7	4	14
		7.1	0	7.1	7.1	50.0	28.6	2.7
		6.7	0	1.4	1.6	3.1	2.9	
		.2	0	.2	.2	1.3	.8	
5.		0	0	0	0	2	0	2
		0	0	0	0	100.0	0	.4
		0	0	0	0	.9	0	
		0	0	0	0	.4	0	
6.		0	0	0	3	4	4	11
		0	0	0	27.3	36.4	36.4	2.1
		0	0	0	4.8	1.7	2.9	
		0	0	0	.6	.8	.8	
COLUMN TOTAL		15	4	73	63	229	139	523
		2.9	.8	14.0	12.0	43.8	26.6	100.0

Q16

CMD	COUNT / ROW PCT / COL PCT / TOT PCT	0	1	2	3	4	5	ROW TOTAL
1.		5	6	28	35	76	24	174
		2.9	3.4	16.1	20.1	43.7	13.8	33.3
		25.0	42.9	40.6	42.2	31.9	24.2	
		1.0	1.1	5.4	6.7	14.5	4.6	
2.		7	5	24	23	97	41	199
		3.5	2.5	12.1	11.6	48.7	20.6	38.0
		35.0	35.7	34.8	27.7	41.6	41.4	
		1.3	1.0	4.6	4.4	18.9	7.8	
3.		7	3	16	22	49	26	123
		5.7	2.4	13.0	17.9	39.8	21.1	23.5
		35.0	21.4	23.2	26.5	20.6	26.3	
		1.3	.6	3.1	4.2	9.4	5.0	
4.		0	0	1	2	6	5	14
		0	0	7.1	14.3	42.9	35.7	2.7
		0	0	1.4	2.4	2.5	5.1	
		0	0	.2	.4	1.1	1.0	
5.		1	0	0	0	1	0	2
		50.0	0	0	0	50.0	0	.4
		5.0	0	0	0	.4	0	
		.2	0	0	0	.2	0	
6.		0	0	0	1	7	3	11
		0	0	0	9.1	63.6	27.3	2.1
		0	0	0	1.2	2.9	3.0	
		0	0	0	.2	1.3	.6	
COLUMN TOTAL		20	14	69	83	238	99	523
		3.8	2.7	13.2	15.9	45.5	18.9	100.0

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RUN NAME        CROSTAB
VARIABLE LIST   BASE,CMD,RANK,YREXP,WTOOL
                Q5,Q6,Q7,Q8,Q9,Q10,Q11
                Q12,Q13,Q14,Q15,Q16
INPUT FORMAT    FREEFIELD
RECODE          CMD('A'=1)('B'=2)('C'=3)('D'=4)('E'=5)('F'=6)/
                RANK('E1'=1)('E2'=2)('E3'=3)('E4'=4)('E5'=5)('E6'=6)
                ('E7'=7)('E8'=8)('E9'=9)(ELSE=0)
                YREXP(1 THRU 24=1)(25 THRU 84=2)
                (85 THRU 144=3)(145 THRU HIGHEST=4)/
                WTOOL('A'=1)('B'=2)(ELSE=0)/
                Q5 TO Q16 ('A'=1)('B'=2)('C'=3)('D'=4)('E'=5)(ELSE=0)
                BASE(1 THRU 43,107 THRU 164,256 THRU 293,
                501 THRU 542,586 THRU 602=1)
                (44 THRU 106,165 THRU 255,294 THRU 500,
                543 THRU 572,603 THRU 623,999=2)

      .081 SECONDS


CROSSTABS       TABLES=YREXP BY Q5 TO Q16
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Q5

YSEXP	COUNT / ROW PCT / COL PCT / TOT PCT	0	1.	2.	3.	4.	5.	ROW TOTAL
1.		4	31	51	51	41	4	182
		2.2	17.0	28.0	28.0	22.5	2.2	34.8
		80.0	25.6	34.7	32.9	50.6	28.6	
		.8	5.9	9.8	9.8	7.8	.8	
2.		1	55	58	61	25	4	204
		.5	27.0	28.4	29.9	12.3	2.0	39.0
		20.0	45.5	39.5	39.4	30.9	28.6	
		.2	10.5	11.1	11.7	4.8	.8	
3.		0	12	16	21	8	2	59
		0	20.3	27.1	35.6	13.6	3.4	11.3
		0	9.9	10.9	13.5	9.9	14.3	
		0	2.3	3.1	4.0	1.5	.4	
4.		0	23	22	22	7	4	78
		0	29.5	28.2	28.2	9.0	5.1	14.9
		0	19.0	15.0	14.2	8.6	28.6	
		0	4.4	4.2	4.2	1.3	.8	
COLUMN TOTAL		5 / 1.0	121 / 23.1	147 / 28.1	155 / 29.6	81 / 15.5	14 / 2.7	523 / 100.0

Q6

YREXP	COUNT / ROW PCT / COL PCT / TOT PCT	0	1.	2.	3.	4.	5.	ROW TOTAL
1.		0	1	4	19	81	77	182
		0	.5	2.2	10.4	44.5	42.3	34.8
		0	33.3	36.4	32.2	39.7	31.7	
		0	.2	.8	3.6	15.5	14.7	
2.		2	1	5	27	72	97	204
		1.0	.5	2.5	13.2	35.3	47.5	39.0
		66.7	33.3	45.5	45.8	35.3	39.9	
		.4	.2	1.0	5.2	13.8	18.5	
3.		1	1	2	5	24	26	59
		1.7	1.7	3.4	8.5	40.7	44.1	11.3
		33.3	33.3	18.2	8.5	11.8	10.7	
		.2	.2	.4	1.0	4.6	5.0	
4.		0	0	0	8	27	43	78
		0	0	0	10.3	34.6	55.1	14.9
		0	0	0	13.6	13.2	17.7	
		0	0	0	1.5	5.2	8.2	
COLUMN TOTAL		3 / .6	3 / .6	11 / 2.1	59 / 11.3	204 / 39.0	243 / 46.5	523 / 100.0

Q7

FREXP	COUNT / ROW PCT / COL PCT / TOT PCT	0	1.	2.	3.	4.	5.	ROW TOTAL
1.		7	23	46	58	41	7	182
		3.8	12.6	25.3	31.9	22.5	3.8	34.8
		63.6	28.4	34.1	33.7	39.4	35.0	
		1.3	4.4	8.8	11.1	7.8	1.3	
2.		2	35	52	68	39	8	204
		1.0	17.2	25.5	33.3	19.1	3.9	39.0
		18.2	43.2	38.5	39.5	37.5	40.0	
		.4	6.7	9.9	13.0	7.5	1.5	
3.		1	10	11	22	12	3	59
		1.7	16.9	18.6	37.3	20.3	5.1	11.3
		9.1	12.3	8.1	12.8	11.5	15.0	
		.2	1.9	2.1	4.2	2.3	.6	
4.		1	13	26	24	12	2	78
		1.3	16.7	33.3	30.8	15.4	2.6	14.9
		9.1	16.0	19.3	14.0	11.5	10.0	
		.2	2.5	5.0	4.6	2.3	.4	
COLUMN TOTAL		11	81	135	172	104	20	523
		2.1	15.5	25.8	32.9	19.9	3.8	100.0

Q8

FREXP	COUNT / ROW PCT / COL PCT / TOT PCT	0	1.	2.	3.	4.	5.	ROW TOTAL
1.		98	8	9	20	33	14	182
		53.8	4.4	4.9	11.0	18.1	7.7	34.8
		33.1	32.0	37.5	41.7	35.5	37.8	
		18.7	1.5	1.7	3.8	6.3	2.7	
2.		111	15	8	22	38	10	204
		54.4	7.4	3.9	10.8	18.6	4.9	39.0
		37.5	60.0	33.3	45.8	40.9	27.0	
		21.2	2.9	1.5	4.2	7.3	1.9	
3.		33	1	5	3	11	6	59
		55.9	1.7	8.5	5.1	18.6	10.2	11.3
		11.1	4.0	20.8	6.3	11.8	16.2	
		6.3	.2	1.0	.6	2.1	1.1	
4.		54	1	2	3	11	7	78
		69.2	1.3	2.6	3.8	14.1	9.0	14.9
		18.2	4.0	8.3	6.3	11.8	18.9	
		10.3	.2	.4	.6	2.1	1.3	
COLUMN TOTAL		296	25	24	48	93	37	523
		56.6	4.8	4.6	9.2	17.9	7.1	100.0

Q9

YREXP	COUNT / ROW PCT / COL PCT / TOT PCT	0	1	2	3	4	5	ROW TOTAL
1.		10	21	30	54	59	8	182
		5.5	11.5	16.5	29.7	32.4	4.4	34.8
		55.6	27.6	33.7	31.4	41.3	32.0	
		1.9	4.0	5.7	10.3	11.3	1.5	
2.		5	36	35	70	48	10	204
		2.5	17.6	17.2	34.3	23.5	4.9	39.0
		27.8	47.4	39.3	40.7	33.6	40.0	
		1.0	6.9	6.7	13.4	9.2	1.9	
3.		3	9	6	20	14	5	59
		5.1	15.3	10.2	33.9	27.1	8.5	11.3
		16.7	11.8	6.7	11.6	11.2	20.0	
		.6	1.7	1.1	3.8	3.1	1.0	
4.		0	10	18	28	20	2	78
		0	12.8	23.1	35.9	25.6	2.6	14.9
		0	13.2	20.2	16.3	14.0	8.0	
		0	1.9	3.4	5.4	3.8	.4	
COLUMN TOTAL		18	76	89	172	143	25	523
		3.4	14.5	17.0	32.9	27.3	4.8	100.0

Q10

YREXP	COUNT / ROW PCT / COL PCT / TOT PCT	0	1	2	3	4	5	ROW TOTAL
1.		105	3	2	15	41	16	182
		57.7	1.6	1.1	8.2	22.5	8.8	34.8
		34.0	37.5	22.2	37.5	40.6	28.6	
		20.1	.6	.4	2.9	7.8	3.1	
2.		115	4	6	18	37	24	204
		56.4	2.0	2.9	8.8	18.1	11.8	39.0
		37.2	50.0	66.7	45.0	36.6	42.9	
		22.0	.8	1.1	3.4	7.1	4.6	
3.		33	1	1	4	13	7	59
		55.9	1.7	1.7	6.8	22.0	11.9	11.3
		10.7	12.5	11.1	10.0	12.9	12.5	
		6.3	.2	.2	.8	2.5	1.3	
4.		56	0	0	3	10	9	78
		71.8	0	0	3.8	12.8	11.5	14.9
		18.1	0	0	7.5	9.9	16.1	
		10.7	0	0	.6	1.9	1.7	
COLUMN TOTAL		309	8	9	40	101	56	523
		59.1	1.5	1.7	7.6	19.3	10.7	100.0

Q11

YREXP	COUNT / ROW PCT / COL PCT / TOT PCT	0	1	2	3	4	5	ROW TOTAL
1.		10	19	32	62	54	5	182
		5.5	10.4	17.6	34.1	29.7	2.7	34.8
		83.3	26.0	32.7	31.3	41.2	45.5	
		1.9	3.6	6.1	11.9	10.3	1.0	
2.		0	34	40	76	52	2	204
		0	16.7	19.6	37.3	25.5	1.0	39.0
		0	46.6	40.8	38.4	39.7	18.2	
		0	6.5	7.6	14.5	9.9	.4	
3.		1	6	7	27	14	4	59
		1.7	10.2	11.9	45.8	23.7	6.8	11.3
		8.3	8.2	7.1	13.6	10.7	36.4	
		.2	1.1	1.3	5.2	2.7	.8	
4.		1	14	19	33	11	0	78
		1.3	17.9	24.4	42.3	14.1	0	14.9
		8.3	19.2	19.4	16.7	8.4	0	
		.2	2.7	3.6	6.3	2.1	0	
COLUMN TOTAL		12	73	98	198	131	11	523
		2.3	14.0	18.7	37.9	25.0	2.1	100.0

Q12

YREXP	COUNT / ROW PCT / COL PCT / TOT PCT	0	1	2	3	4	5	ROW TOTAL
1.		99	2	2	8	49	22	182
		54.4	1.1	1.1	4.4	26.9	12.1	34.8
		33.2	50.0	28.6	25.0	40.2	36.7	
		18.9	.4	.4	1.5	9.4	4.2	
2.		110	1	4	17	46	26	204
		53.9	.5	2.0	8.3	22.5	12.7	39.0
		36.9	25.0	57.1	53.1	37.7	43.3	
		21.0	.2	.8	3.3	8.8	5.0	
3.		33	0	1	5	13	7	59
		55.9	0	1.7	8.5	22.0	11.9	11.3
		11.1	0	14.3	15.6	10.7	11.7	
		6.3	0	.2	1.0	2.5	1.3	
4.		56	1	0	2	14	5	78
		71.8	1.3	0	2.6	17.9	6.4	14.9
		18.8	25.0	0	6.3	11.5	8.3	
		10.7	.2	0	.4	2.7	1.0	
COLUMN TOTAL		298	4	7	32	122	60	523
		57.0	.8	1.3	6.1	23.3	11.5	100.0

Q13

YREXP	COUNT / ROW PCT / COL PCT / TOT PCT	0	1	2	3	4	5	ROW TOTAL
1.		18	3	24	20	75	42	182
		9.9	1.6	13.2	11.0	41.2	23.1	34.8
		94.7	23.1	46.2	47.6	32.2	25.6	
		3.4	.6	4.6	3.8	14.3	8.0	
2.		0	5	13	13	94	79	204
		0	2.5	6.4	6.4	46.1	38.7	39.0
		0	38.5	25.0	31.0	40.3	48.2	
		0	1.0	2.5	2.5	18.0	15.1	
3.		0	2	6	3	28	20	59
		0	3.4	10.2	5.1	47.5	33.9	11.3
		0	15.4	11.5	7.1	12.0	12.2	
		0	.4	1.1	.6	5.4	3.8	
4.		1	3	9	6	36	23	78
		1.3	3.8	11.5	7.7	46.2	29.5	14.9
		5.3	23.1	17.3	14.3	15.5	14.0	
		.2	.6	1.7	1.1	6.9	4.4	
COLUMN TOTAL		19	13	52	42	233	164	523
		3.6	2.5	9.9	8.0	44.6	31.4	100.0

Q14

YREXP	COUNT / ROW PCT / COL PCT / TOT PCT	0	1	2	3	4	5	ROW TOTAL
1.		13	4	22	38	84	21	182
		7.1	2.2	12.1	20.9	46.2	11.5	34.8
		65.0	33.3	34.4	35.5	34.9	26.6	
		2.5	.8	4.2	7.3	16.1	4.0	
2.		5	6	25	44	92	32	204
		2.5	2.9	12.3	21.6	45.1	15.7	39.0
		25.0	50.0	39.1	41.1	38.2	40.5	
		1.0	1.1	4.8	8.4	17.6	6.1	
3.		1	1	7	17	26	7	59
		1.7	1.7	11.9	28.8	44.1	11.9	11.3
		5.0	8.3	10.9	15.9	10.8	8.9	
		.2	.2	1.3	3.3	5.0	1.3	
4.		1	1	10	8	39	19	78
		1.3	1.3	12.8	10.3	50.0	24.4	14.9
		5.0	8.3	15.6	7.5	16.2	24.1	
		.2	.2	1.9	1.5	7.5	3.6	
COLUMN TOTAL		20	12	64	107	241	79	523
		3.8	2.3	12.2	20.5	46.1	15.1	100.0

Q15

YREXP	COUNT / ROW PCT / COL PCT / TOT PCT	0	1	2	3	4	5	ROW TOTAL
1.		8	0	35	31	74	34	182
		4.4	0	19.2	17.0	40.7	18.7	34.8
		53.3	0	47.9	49.2	32.3	24.5	
		1.5	0	6.7	5.9	14.1	6.5	
2.		1	3	23	26	87	64	204
		.5	1.5	11.3	12.7	42.6	31.4	39.0
		6.7	75.0	31.5	41.3	38.0	46.0	
		.2	.6	4.4	5.0	16.6	12.2	
3.		2	1	7	4	29	16	59
		3.4	1.7	11.9	6.8	49.2	27.1	11.3
		13.3	25.0	9.6	6.3	12.7	11.5	
		.4	.2	1.3	.8	5.5	3.1	
4.		4	0	8	2	39	25	78
		5.1	0	10.3	2.6	50.0	32.1	14.9
		26.7	0	11.0	3.2	17.0	18.0	
		.8	0	1.5	.4	7.5	4.8	
COLUMN TOTAL		15	4	73	63	229	139	523
		2.9	.8	14.0	12.0	43.8	26.6	100.0

Q16

YREXP	COUNT / ROW PCT / COL PCT / TOT PCT	0	1	2	3	4	5	ROW TOTAL
1.		8	7	24	32	78	33	182
		4.4	3.8	13.2	17.6	42.9	18.1	34.8
		40.0	50.0	34.8	38.6	32.8	33.3	
		1.5	1.3	4.6	6.1	14.9	6.3	
2.		8	6	27	34	100	29	204
		3.9	2.9	13.2	16.7	49.0	14.2	39.0
		40.0	42.9	39.1	41.0	42.0	29.3	
		1.5	1.1	5.2	6.5	19.1	5.5	
3.		1	1	7	12	27	11	59
		1.7	1.7	11.9	20.3	45.8	18.6	11.3
		5.0	7.1	10.1	14.5	11.3	11.1	
		.2	.2	1.3	2.3	5.2	2.1	
4.		3	0	11	5	33	26	78
		3.8	0	14.1	6.4	42.3	33.3	14.9
		15.0	0	15.9	6.0	13.9	26.3	
		.6	0	2.1	1.0	6.3	5.0	
COLUMN TOTAL		20	14	69	83	238	99	523
		3.8	2.7	13.2	15.9	45.5	18.9	100.0

```
RUN NAME          CROSTAB
VARIABLE LIST     BASE,CMD,RANK,YREXP,WTOOL
                  Q5,Q6,Q7,Q8,Q9,Q10,Q11
                  Q12,Q13,Q14,Q15,Q16
INPUT FORMAT      FREEFIELD
RECODE            CMD('A'=1)('B'=2)('C'=3)('D'=4)('E'=5)('F'=6)/
                  RANK('E1'=1)('E2'=2)('E3'=3)('E4'=4)('E5'=5)('E6'=6)
                  ('E7'=7)('E8'=8)('E9'=9)(ELSE=0)
                  YREXP(1 THRU 24=1)(25 THRU 84=2)
                  (85 THRU 144=3)(145 THRU HIGHEST=4)/
                  WTOOL('A'=1)('B'=2)(ELSE=0)/
                  Q5 TO Q16 ('A'=1)('B'=2)('C'=3)('D'=4)('E'=5)(ELSE=0)
                  BASE(1 THRU 43,107 THRU 164,256 THRU 293,
                  501 THRU 542,586 THRU 602=1)
                  (44 THRU 106,165 THRU 255,294 THRU 500,
                  543 THRU 572,603 THRU 623,999=2)

      .078 SECONDS


CROSSTABS         TABLES=BASE BY Q5 TO Q16
```

Q5

BASE		0	1	2	3	4	5	ROW TOTAL
1.	COUNT	1	53	49	42	16	4	165
	ROW PCT	.6	32.1	29.7	25.5	9.7	2.4	31.5
	COL PCT	20.0	43.8	33.3	27.1	19.8	28.6	
	TOT PCT	.2	10.1	9.4	8.0	3.1	.8	
2.	COUNT	4	68	98	113	65	10	358
	ROW PCT	1.1	19.0	27.4	31.6	18.2	2.8	68.5
	COL PCT	80.0	56.2	66.7	72.9	80.2	71.4	
	TOT PCT	.8	13.0	18.7	21.6	12.4	1.9	
COLUMN TOTAL		5	121	147	155	81	14	523
		1.0	23.1	28.1	29.6	15.5	2.7	100.0

Q6

BASE		0	1	2	3	4	5	ROW TOTAL
1.	COUNT	0	0	2	18	60	85	165
	ROW PCT	0	0	1.2	10.9	36.4	51.5	31.5
	COL PCT	0	0	18.2	30.5	29.4	35.0	
	TOT PCT	0	0	.4	3.4	11.5	16.3	
2.	COUNT	3	3	9	41	144	158	358
	ROW PCT	.8	.8	2.5	11.5	40.2	44.1	68.5
	COL PCT	100.0	100.0	81.8	69.5	70.6	65.0	
	TOT PCT	.6	.6	1.7	7.8	27.5	30.2	
COLUMN TOTAL		3	3	11	59	204	243	523
		.6	.6	2.1	11.3	39.0	46.5	100.0

Q7

BASE		0	1	2	3	4	5	ROW TOTAL
1.	COUNT	3	39	50	53	20	0	165
	ROW PCT	1.8	23.6	30.3	32.1	12.1	0	31.5
	COL PCT	27.3	48.1	37.0	30.8	19.2	0	
	TOT PCT	.6	7.5	9.6	10.1	3.8	0	
2.	COUNT	8	42	85	119	84	20	358
	ROW PCT	2.2	11.7	23.7	33.2	23.5	5.6	68.5
	COL PCT	72.7	51.9	63.0	69.2	80.8	100.0	
	TOT PCT	1.5	9.0	16.3	22.8	16.1	3.8	
COLUMN TOTAL		11	81	135	172	104	20	523
		2.1	15.5	25.8	32.9	19.9	3.8	100.0

Q8

BASE		0	1.	2.	3.	4.	5.	ROW TOTAL
1.	COUNT	92	3	1	15	34	20	165
	ROW PCT	55.8	1.8	.6	9.1	20.6	12.1	31.5
	COL PCT	31.1	12.0	4.2	31.3	36.6	54.1	
	TOT PCT	17.6	.6	.2	2.9	6.5	3.8	
2.	COUNT	204	22	23	33	59	17	358
	ROW PCT	57.0	6.1	6.4	9.2	16.5	4.7	68.5
	COL PCT	68.9	88.0	95.8	68.8	63.4	45.9	
	TOT PCT	39.0	4.2	4.4	6.3	11.3	3.3	
COLUMN TOTAL		296	25	24	48	93	37	523
		56.6	4.8	4.6	9.2	17.8	7.1	100.0

Q9

BASE		0	1.	2.	3.	4.	5.	ROW TOTAL
1.	COUNT	8	43	33	45	33	3	165
	ROW PCT	4.8	26.1	20.0	27.3	20.0	1.8	31.5
	COL PCT	44.4	56.6	37.1	26.2	23.1	12.0	
	TOT PCT	1.5	8.2	6.3	8.6	6.3	.6	
2.	COUNT	10	33	56	127	110	22	358
	ROW PCT	2.8	9.2	15.6	35.5	30.7	6.1	68.5
	COL PCT	55.6	43.4	62.9	73.8	76.9	88.0	
	TOT PCT	1.9	6.3	10.7	24.3	21.0	4.2	
COLUMN TOTAL		18	76	89	172	143	25	523
		3.4	14.5	17.0	32.9	27.3	4.8	100.0

Q10

BASE		0	1.	2.	3.	4.	5.	ROW TOTAL
1.	COUNT	103	2	2	10	28	20	165
	ROW PCT	62.4	1.2	1.2	6.1	17.0	12.1	31.5
	COL PCT	33.3	25.0	22.2	25.0	27.7	35.7	
	TOT PCT	19.7	.4	.4	1.9	5.4	3.8	
2.	COUNT	206	6	7	30	73	36	358
	ROW PCT	57.5	1.7	2.0	8.4	20.4	10.1	68.5
	COL PCT	66.7	75.0	77.8	75.0	72.3	64.3	
	TOT PCT	39.4	1.1	1.3	5.7	14.0	6.9	
COLUMN TOTAL		309	8	9	40	101	56	523
		59.1	1.5	1.7	7.6	19.3	10.7	100.0

Q11

BASE		0	1	2	3	4	5	ROW TOTAL
1.	COUNT	6	41	29	53	55	1	165
	ROW PCT	3.6	24.8	17.6	32.1	21.2	.6	31.5
	COL PCT	50.0	56.2	29.6	26.8	26.7	9.1	
	TOT PCT	1.1	7.8	5.5	10.1	5.7	.2	
2.	COUNT	6	32	69	145	76	10	358
	ROW PCT	1.7	8.9	19.3	40.5	26.8	2.8	68.5
	COL PCT	50.0	43.8	70.4	73.2	73.3	90.9	
	TOT PCT	1.1	6.1	13.2	27.7	18.4	1.9	
COLUMN TOTAL		12 2.3	73 14.0	98 18.7	198 37.9	131 25.0	11 2.1	523 100.0

Q12

BASE		0	1	2	3	4	5	ROW TOTAL
1.	COUNT	103	0	1	7	40	14	165
	ROW PCT	62.4	0	.6	4.2	24.2	8.5	31.5
	COL PCT	34.6	0	14.3	21.9	32.8	23.3	
	TOT PCT	19.7	0	.2	1.3	7.6	2.7	
2.	COUNT	195	4	6	25	82	46	358
	ROW PCT	54.5	1.1	1.7	7.0	22.9	12.8	68.5
	COL PCT	65.4	100.0	85.7	78.1	67.2	76.7	
	TOT PCT	37.3	.8	1.1	4.8	15.7	8.8	
COLUMN TOTAL		298 57.0	4 .8	7 1.3	32 6.1	122 23.3	60 11.5	523 100.0

Q13

BASE		0	1	2	3	4	5	ROW TOTAL
1.	COUNT	2	3	8	13	81	58	165
	ROW PCT	1.2	1.8	4.8	7.9	49.1	35.2	31.5
	COL PCT	10.5	23.1	15.4	31.0	34.8	35.4	
	TOT PCT	.4	.6	1.5	2.5	15.5	11.1	
2.	COUNT	17	10	44	29	152	106	358
	ROW PCT	4.7	2.8	12.3	8.1	42.5	29.6	68.5
	COL PCT	89.5	76.9	84.6	69.0	65.2	64.6	
	TOT PCT	3.3	1.9	8.4	5.5	29.1	20.3	
COLUMN TOTAL		19 3.6	13 2.5	52 9.9	42 8.0	233 44.6	164 31.4	523 100.0

Q14

BASE	COUNT / ROW PCT / COL PCT / TOT PCT	0	1	2	3	4	5	ROW TOTAL
1.		3	2	16	34	78	32	165
	ROW PCT	1.8	1.2	9.7	20.6	47.3	19.4	31.5
	COL PCT	15.0	16.7	25.0	31.8	32.4	40.5	
	TOT PCT	.6	.4	3.1	6.5	14.9	6.1	
2.		17	10	48	73	163	47	358
	ROW PCT	4.7	2.8	13.4	20.4	45.5	13.1	68.5
	COL PCT	85.0	83.3	75.0	68.2	67.6	59.5	
	TOT PCT	3.3	1.9	9.2	14.0	31.2	9.0	
COLUMN TOTAL		20 3.8	12 2.3	64 12.2	107 20.5	241 46.1	79 15.1	523 100.0

Q15

BASE	COUNT / ROW PCT / COL PCT / TOT PCT	0	1	2	3	4	5	ROW TOTAL
1.		1	1	15	20	73	55	165
	ROW PCT	.6	.6	9.1	12.1	44.2	33.3	31.5
	COL PCT	6.7	25.0	20.5	31.7	31.9	39.6	
	TOT PCT	.2	.2	2.9	3.8	14.0	10.5	
2.		14	3	58	43	156	84	358
	ROW PCT	3.9	.8	16.2	12.0	43.6	23.5	68.5
	COL PCT	93.3	75.0	79.5	68.3	68.1	60.4	
	TOT PCT	2.7	.6	11.1	8.2	29.8	16.1	
COLUMN TOTAL		15 2.9	4 .8	73 14.0	63 12.0	229 43.8	139 26.6	523 100.0

Q16

BASE	COUNT / ROW PCT / COL PCT / TOT PCT	0	1	2	3	4	5	ROW TOTAL
1.		6	2	17	24	78	38	165
	ROW PCT	3.6	1.2	10.3	14.5	47.3	23.0	31.5
	COL PCT	30.0	14.3	24.6	28.9	32.8	38.4	
	TOT PCT	1.1	.4	3.3	4.6	14.9	7.3	
2.		14	12	52	59	160	61	358
	ROW PCT	3.9	3.4	14.5	16.5	44.7	17.0	68.5
	COL PCT	70.0	85.7	75.4	71.1	67.2	61.6	
	TOT PCT	2.7	2.3	9.9	11.3	30.6	11.7	
COLUMN TOTAL		20 3.8	14 2.7	69 13.2	83 15.9	238 45.5	99 18.9	523 100.0

FREQUENCIES

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RUN NAME        FREQ
VARIABLE LIST   BASE,CMD,RANK,YREXP,WTOOL
                Q5,Q6,Q7,Q8,Q9,Q10,Q11
                Q12,Q13,Q14,Q15,Q16
INPUT FORMAT    FREEFIELD
RECODE          CMD('A'=1)('B'=2)('C'=3)('D'=4)('E'=5)('F'=6)/
                RANK('E1'=1)('E2'=2)('E3'=3)('E4'=4)('E5'=5)('E6'=6)
                ('E7'=7)('E8'=8)('E9'=9)(ELSE=0)
                WTOOL('A'=1)('B'=2)(ELSE=0)/
                Q5 TO Q16 ('A'=1)('B'=2)('C'=3)('D'=4)('E'=5)(ELSE=0)
MISSING VALUES Q5 TO Q16(0)
SELECT IF       (Q5 NE 0 AND Q6 NE 0)
SELECT IF       (Q7 NE 0 AND Q8 NE 0)
SELECT IF       (Q9 NE 0 AND Q10 NE 0)
SELECT IF       (Q11 NE 0 AND Q12 NE 0)

FREQUENCIES     GENERAL=ALL
OPTIONS         3,5,8,9,10,11
STATISTICS      ALL
READ INPUT DATA
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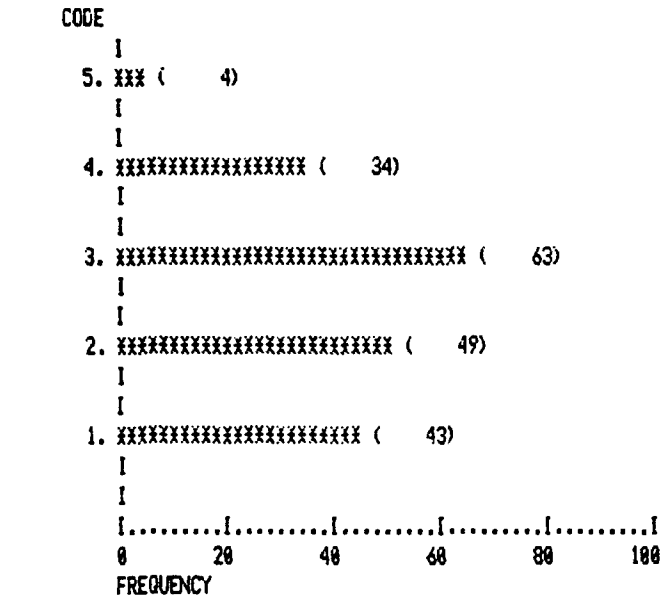
Q5

CODE	FREQ	ADJ PCT	CUM PCT	CODE	FREQ	ADJ PCT	CUM PCT	CODE	FREQ	ADJ PCT	CUM PCT
5.	4	2	2	3.	63	33	52	1.	43	22	100
4.	34	18	20	2.	49	25	78				

Q5

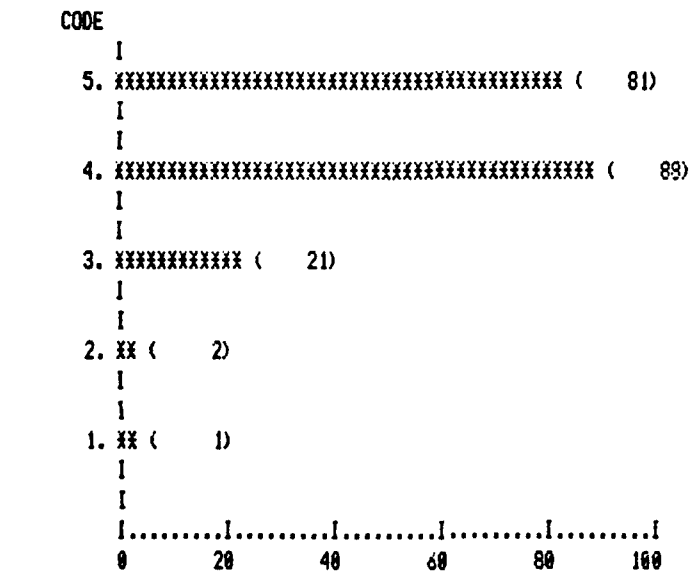


MEAN	2.518	STD ERR	.078	MEDIAN	2.571
MODE	3.000	STD DEV	1.085	VARIANCE	1.178
KURTOSIS	-.914	SKEWNESS	.089	RANGE	4.000
MINIMUM	1.000	MAXIMUM	5.000	SUM	486.000
C.V. PCT	43.103	.95 C.I.	2.364	TO	2.672

Q6

CODE	FREQ	ADJ PCT	CUM PCT	CODE	FREQ	ADJ PCT	CUM PCT	CODE	FREQ	ADJ PCT	CUM PCT
5.	81	42	42	3.	21	11	98	1.	1	1	100
4.	88	46	88	2.	2	1	99				

Q6

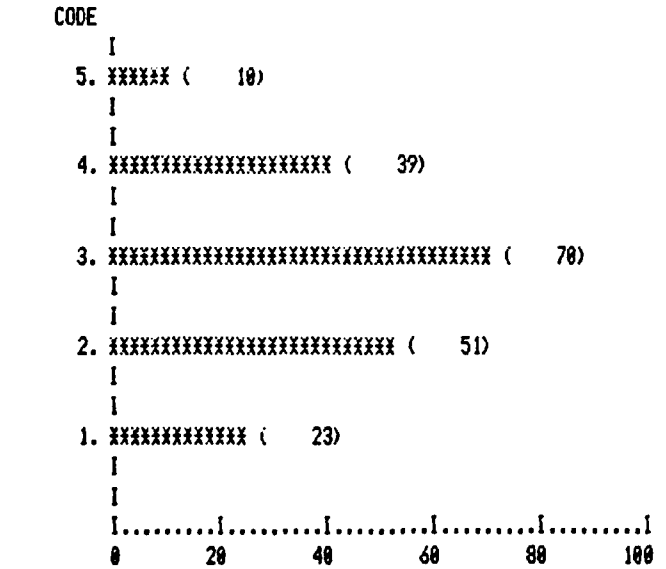


MEAN	4.275	STD ERR	.053	MEDIAN	4.324
MODE	4.000	STD DEV	.738	VARIANCE	.544
KURTOSIS	1.436	SKEWNESS	-.958	RANGE	4.000
MINIMUM	1.000	MAXIMUM	5.000	SUM	825.000
C.V. PCT	17.254	.95 C.I.	4.170	TO	4.379

Q7

CODE	FREQ	ADJ PCT	CUM PCT	CODE	FREQ	ADJ PCT	CUM PCT	CODE	FREQ	ADJ PCT	CUM PCT
5.	10	5	5	3.	70	36	62	1.	23	12	100
4.	39	20	25	2.	51	26	88				

Q7



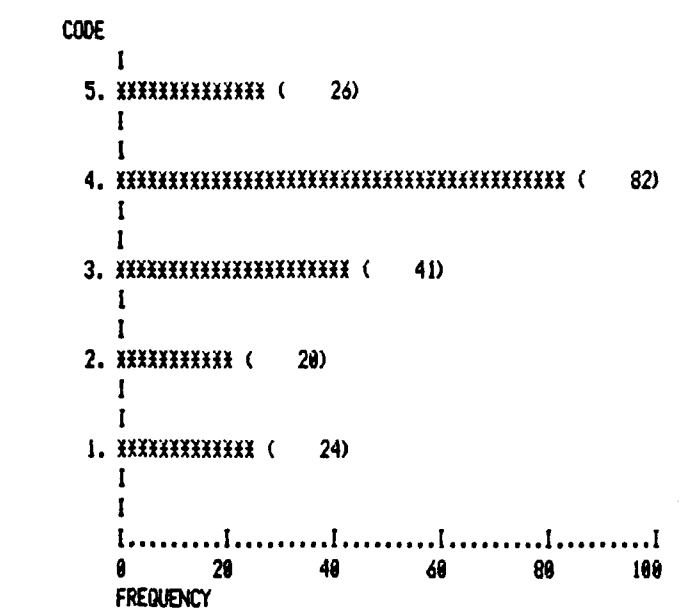
MEAN	2.883	STD ERR	.076	MEDIAN	2.821
MODE	3.000	STD DEV	1.057	VARIANCE	1.117
KURTOSIS	-.562	SKEWNESS	.054	RANGE	4.000
MINIMUM	1.000	MAXIMUM	5.000	SUM	541.000
C.V. PCT	37.709	.95 C.I.	2.653	TO	2.953

VALID CASES 193 MISSING CASES 0

Q8

CODE	FREQ	PCT	ADJ PCT	CUM PCT	CODE	FREQ	PCT	ADJ PCT	CUM PCT	CODE	FREQ	PCT	ADJ PCT	CUM PCT
5.	26	13	13	13	3.	41	21	21	77	1.	24	12	12	100
4.	82	42	42	56	2.	20	10	10	88					

Q8



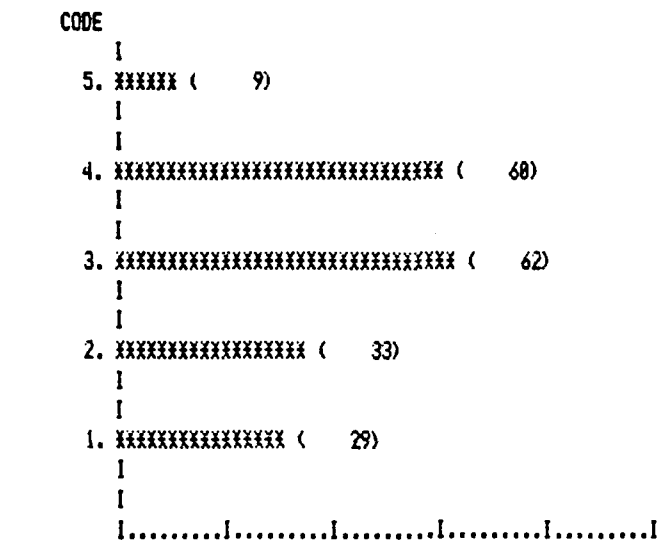
MEAN	3.342	STD ERR	.887	MEDIAN	3.640
MODE	4.000	STD DEV	1.206	VARIANCE	1.455
KURTOSIS	-.512	SKEWNESS	-.649	RANGE	4.000
MINIMUM	1.000	MAXIMUM	5.000	SUM	645.000
C.V. PCT	36.098	.95 C.I.	3.171	TO	3.513

VALID CASES 193 MISSING CASES 0

Q9

CODE	FREQ	ADJ PCT	CUM PCT	CODE	FREQ	ADJ PCT	CUM PCT	CODE	FREQ	ADJ PCT	CUM PCT
5.	9	5	5	3.	62	32	68	1.	29	15	100
4.	60	31	36	2.	33	17	85				

Q9



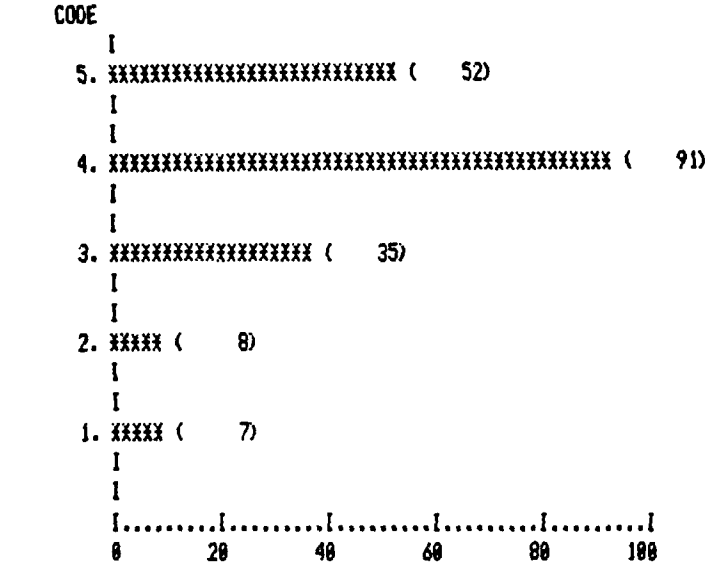
MEAN	2.933	STD ERR	.081	MEDIAN	3.056
MODE	3.000	STD DEV	1.128	VARIANCE	1.271
KURTOSIS	-.814	SKEWNESS	-.307	RANGE	4.000
MINIMUM	1.000	MAXIMUM	5.000	SUM	566.000
C.V. PCT	38.450	.95 C.I.	2.773	TO	3.093

VALID CASES 193 MISSING CASES 0

Q10

CODE	FREQ	ADJ PCT	CUM PCT	CODE	FREQ	ADJ PCT	CUM PCT	CODE	FREQ	ADJ PCT	CUM PCT
5.	52	27	27	3.	35	18	92	1.	7	4	100
4.	91	47	74	2.	8	4	96				

Q10



MEAN	3.896	STD ERR	.070	MEDIAN	4.011
MODE	4.000	STD DEV	.968	VARIANCE	.937
KURTOSIS	1.210	SKEWNESS	-1.043	RANGE	4.000
MINIMUM	1.000	MAXIMUM	5.000	SUM	752.000
C.V. PCT	24.845	.95 C.I.	3.759	TO	4.034

VALID CASES 193 MISSING CASES 0

CODE	FREQ	ADJ PCT	CUM PCT	CODE	FREQ	ADJ PCT	CUM PCT	CODE	FREQ	ADJ PCT	CUM PCT
5.	3	2	2	3.	79	41	76	1.	18	9	100
4.	65	34	35	2.	28	15	91				

Q11

```
    CODE
        I
     5. XXX (     3)
        I
        I
     4. XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX (    65)
        I
        I
     3. XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX (    79)
        I
        I
     2. XXXXXXXXXXXXXXX (    28)
        I
        I
     1. XXXXXXXXXX (    18)
        I
        I
        I.........I.........I.........I.........I.........I
        0        20        40        60        80       100
        FREQUENCY
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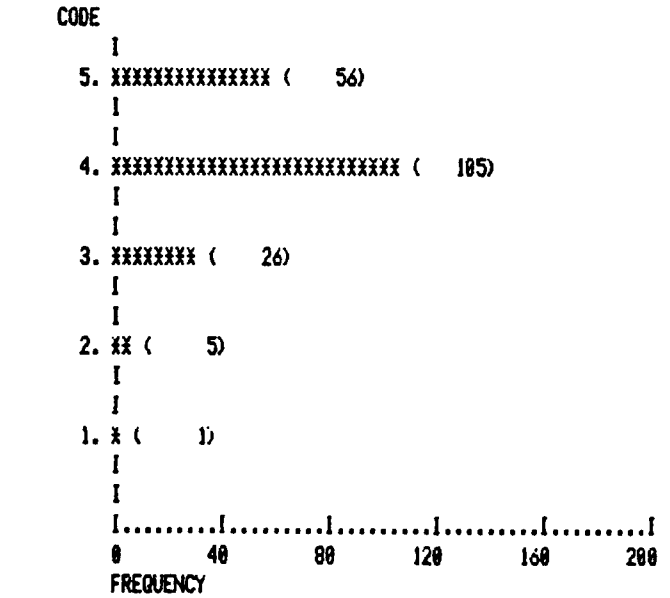
MEAN	3.036	STD ERR	.069	MEDIAN	3.139
MODE	3.000	STD DEV	.959	VARIANCE	.921
KURTOSIS	-.242	SKEWNESS	-.689	RANGE	4.000
MINIMUM	1.000	MAXIMUM	5.000	SUM	586.000
C.V. PCT	31.600	.95 C.I.	2.900	TO	3.172

VALID CASES 193 MISSING CASES 0

Q12

CODE	FREQ	ADJ PCT	CUM PCT	CODE	FREQ	ADJ PCT	CUM PCT	CODE	FREQ	ADJ PCT	CUM PCT
5.	56	29	29	3.	26	13	97	1.	1	1	100
4.	105	54	83	2.	5	3	99				

Q12



MEAN	4.088	STD ERR	.054	MEDIAN	4.114
MODE	4.000	STD DEV	.755	VARIANCE	.570
KURTOSIS	1.267	SKEWNESS	-.807	RANGE	4.000
MINIMUM	1.000	MAXIMUM	5.000	SUM	789.000
C.V. PCT	18.473	.95 C.I.	3.981	TO	4.195

VALID CASES 193 MISSING CASES 0

Q13

CODE	FREQ	ADJ PCT	CUM PCT	CODE	FREQ	ADJ PCT	CUM PCT	CODE	FREQ	ADJ PCT	CUM PCT
5.	60	32	32	3.	21	11	89	1.	5	3	100
4.	88	46	78	2.	16	8	97				

MISSING DATA

CODE	FREQ	CODE	FREQ	CODE	FREQ

Q13

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    CODE
       I
     5. XXXXXXXXXXXXXXXXXXXXXXXXXXXXXX (    60)
       I
       I
     4. XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX (    88)
       I
       I
     3. XXXXXXXXXXX (    21)
       I
       I
     2. XXXXXXXXX (    16)
       I
       I
     1. XXXX (     5)
       I
       I
     0 XXX (     3)
(MISSING) I
       I
       I.........I.........I.........I.........I.........I
       0        20        40        60        80       100
       FREQUENCY
```

MEAN	3.950	STD ERR	.073	MEDIAN	4.102
MODE	4.000	STD DEV	1.002	VARIANCE	1.004
KURTOSIS	.782	SKEWNESS	-1.064	RANGE	4.000
MINIMUM	1.000	MAXIMUM	5.000	SUM	752.000
C.V. PCT	25.310	.95 C.I.	3.815	TO	4.101

VALID CASES 190 MISSING CASES 3

Q14

CODE	FREQ	ADJ PCT	CUM PCT	CODE	FREQ	ADJ PCT	CUM PCT	CODE	FREQ	ADJ PCT	CUM PCT
5.	25	13	13	3.	38	20	81	1.	6	3	100
4.	89	48	61	2.	29	16	97				

MISSING DATA

CODE	FREQ	CODE	FREQ	CODE	FREQ
0	6				

Q14

```
    CODE
       I
     5. XXXXXXXXXXXXXX (    25)
       I
       I
     4. XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX (    89)
       I
       I
     3. XXXXXXXXXXXXXXXXXXXX (    38)
       I
       I
     2. XXXXXXXXXXXXXXXX (    29)
       I
       I
     1. XXXX (     6)
       I
       I
      0 XXXX (     6)
(MISSING) I
       I
       I.........I.........I.........I.........I.........I
       0        20        40        60        80       100
       FREQUENCY
```

MEAN	3.524	STD ERR	.074	MEDIAN	3.730
MODE	4.000	STD DEV	1.012	VARIANCE	1.025
KURTOSIS	-.269	SKEWNESS	-.600	RANGE	4.000
MINIMUM	1.000	MAXIMUM	5.000	SUM	659.000
C.V. PCT	28.728	.95 C.I.	3.378	TO	3.670

VALID CASES 187 MISSING CASES 6

Q15

CODE	FREQ	ADJ PCT	CUM PCT	CODE	FREQ	ADJ PCT	CUM PCT	CODE	FREQ	ADJ PCT	CUM PCT
5.	44	23	23	3.	21	11	82	1.	1	1	100
4.	91	48	71	2.	33	17	99				

MISSING DATA

CODE	FREQ	CODE	FREQ	CODE	FREQ
0	3				

Q15

```
    CODE
       I
     5. XXXXXXXXXXXXXXXXXXXXXXX (    44)
       I
       I
     4. XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX (    91)
       I
       I
     3. XXXXXXXXXXXX (    21)
       I
       I
     2. XXXXXXXXXXXXXXXXXX (    33)
       I
       I
     1. XX (     1)
       I
       I
      0 XXX (     3)
(MISSING) I
       I
       I.........I.........I.........I.........I.........I
       0        20        40        60        80       100
       FREQUENCY
```

MEAN	3.758	STD ERR	.074	MEDIAN	3.940
MODE	4.000	STD DEV	1.015	VARIANCE	1.031
KURTOSIS	-.557	SKEWNESS	-.632	RANGE	4.000
MINIMUM	1.000	MAXIMUM	5.000	SUM	714.000
C.V. PCT	27.020	.95 C.I.	3.613	TO	3.903

VALID CASES 190 MISSING CASES 3

Q16

CODE	FREQ	PCT	ADJ PCT	CUM PCT	CODE	FREQ	PCT	ADJ PCT	CUM PCT	CODE	FREQ	PCT	ADJ PCT	CUM PCT
5.	30	16	16	16	3.	34	18	18	79	1.	5	3	3	100
4.	86	46	46	61	2.	34	18	18	97					

MISSING DATA

CODE	FREQ	CODE	FREQ	CODE	FREQ
0	4				

Q16

```
    CODE
        I
     5. XXXXXXXXXXXXXXX (    30)
        I
        I
     4. XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX (    86)
        I
        I
     3. XXXXXXXXXXXXXXXXXX (    34)
        I
        I
     2. XXXXXXXXXXXXXXXXXX (    34)
        I
        I
     1. XXXX (     5)
        I
        I
      0 XXX (     4)
(MISSING) I
        I
        I.........I.........I.........I.........I.........I
        0        20        40        60        80       100
        FREQUENCY
```

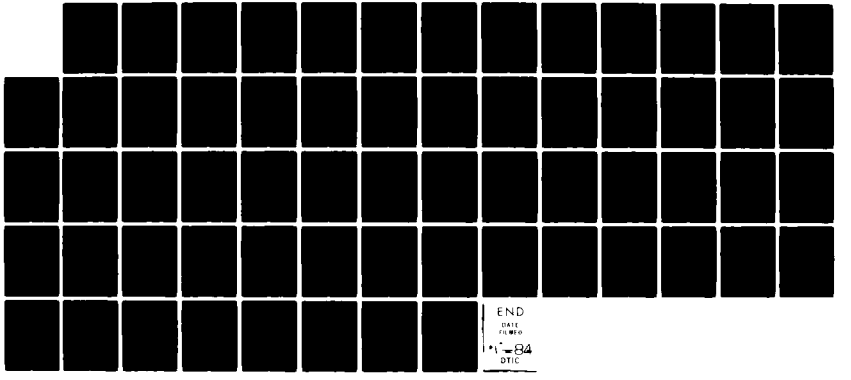
MEAN	3.540	STD ERR	.076	MEDIAN	3.750
MODE	4.000	STD DEV	1.044	VARIANCE	1.090
KURTOSIS	-.543	SKEWNESS	-.517	RANGE	4.000
MINIMUM	1.000	MAXIMUM	5.000	SUM	669.000
C.V. PCT	29.497	.95 C.I.	3.390	TO	3.690

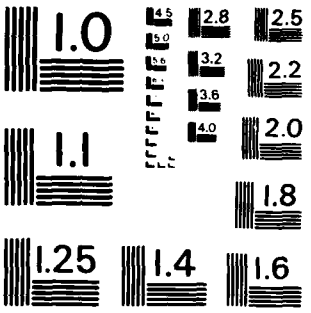
VALID CASES 189 MISSING CASES 4

PAIRED T-TEST

AD-A135 608 AN ATTITUDE SURVEY ANALYSIS OF CONUS AIR FORCE JET PROPULSION TECHNICIANS..(U) AIR FORCE INST OF TECH WRIGHT-PATTERSON AFB OH SCHOOL OF SYST.. 3/3

UNCLASSIFIED M A MIDAY ET AL. SEP 83 AFIT-LSSR-110-83 F/G 5/9 NL





```
RUN NAME        T-TEST
VARIABLE LIST   BASE,CMD,RANK,YREXP,WTOOL
                Q5,Q6,Q7,Q8,Q9,Q10,Q11
                Q12,Q13,Q14,Q15,Q16
INPUT FORMAT    FREEFIELD
RECODE          CMD('A'=1)('B'=2)('C'=3)('D'=4)('E'=5)('F'=6)/
                RANK('E1'=1)('E2'=2)('E3'=3)('E4'=4)('E5'=5)('E6'=6)
                ('E7'=7)('E8'=8)('E9'=9)(ELSE=0)
                YREXP(1 THRU 24=1)(25 THRU 84=2)
                (85 THRU 144=3)(145 THRU HIGHEST=4)/
                WTOOL('A'=1)('B'=2)(ELSE=0)/
                Q5 TO Q16 ('A'=1)('B'=2)('C'=3)('D'=4)('E'=5)(ELSE=0)
                BASE(1 THRU 43,107 THRU 164,256 THRU 293,
                501 THRU 542,586 THRU 602=1)
                (44 THRU 106,165 THRU 255,294 THRU 500,
                543 THRU 572,603 THRU 623,999=2)
SELECT IF       (Q5 NE 0 AND Q6 NE 0)
SELECT IF       (Q7 NE 0 AND Q8 NE 0)
SELECT IF       (Q9 NE 0 AND Q10 NE 0)
SELECT IF       (Q11 NE 0 AND Q12 NE 0)

      .097 SECONDS


T-TEST          PAIRS=Q13 WITH Q16
```

FILE NONAME (CREATION DATE = 08/01/83)

T - T E S T

VARIABLE	NUMBER OF CASES	MEAN	STANDARD DEVIATION	STANDARD ERROR	(DIFFERENCE) MEAN	STANDARD DEVIATION	STANDARD ERROR	CORR.	2-TAIL PROB.	T VALUE	DEGREES OF FREEDOM	2-TAIL PROB.
Q13	193	3.8964	1.109	.080	.4301	1.322	.095	.316	.000	4.52	192	.000
Q16		3.4663	1.150	.083								

```
RUN NAME        T-TEST
VARIABLE LIST   BASE,CMD,RANK,YREXP,MTOOL
                Q5,Q6,Q7,Q8,Q9,Q10,Q11
                Q12,Q13,Q14,Q15,Q16
INPUT FORMAT    FREEFIELD
RECODE          CMD('A'=1)('B'=2)('C'=3)('D'=4)('E'=5)('F'=6)/
                RANK('E1'=1)('E2'=2)('E3'=3)('E4'=4)('E5'=5)('E6'=6)
                ('E7'=7)('E8'=8)('E9'=9)(ELSE=0)
                YREXP(1 THRU 24=1)(25 THRU 84=2)
                (85 THRU 144=3)(145 THRU HIGHEST=4)/
                MTOOL('A'=1)('B'=2)(ELSE=0)/
                Q5 TO Q16 ('A'=1)('B'=2)('C'=3)('D'=4)('E'=5)(ELSE=0)
                BASE(1 THRU 43,107 THRU 164,256 THRU 293,
                501 THRU 542,586 THRU 602=1)
                (44 THRU 106,165 THRU 255,294 THRU 500,
                543 THRU 572,603 THRU 623,999=2)
SELECT IF       (Q5 NE 0 AND Q6 NE 0)
SELECT IF       (Q7 NE 0 AND Q8 NE 0)
SELECT IF       (Q9 NE 0 AND Q10 NE 0)
SELECT IF       (Q11 NE 0 AND Q12 NE 0)
T-TEST          PAIRS=Q5 WITH Q6/Q7 WITH Q8/Q9 WITH Q10/Q11 WITH Q12
```

VARIABLE	NUMBER OF CASES	MEAN	STANDARD DEVIATION	STANDARD ERROR	(DIFFERENCE) MEAN	STANDARD DEVIATION	STANDARD ERROR	CORR.	2-TAIL PROB.	T VALUE	DEGREES OF FREEDOM	2-TAIL PROB.
Q5												
		2.5181	1.085	.078								
	193				-1.7565	1.345	.097	-.055	.447	-18.14	192	.000
		4.2746	.738	.053								
Q6												

VARIABLE	NUMBER OF CASES	MEAN	STANDARD DEVIATION	STANDARD ERROR	(DIFFERENCE) MEAN	STANDARD DEVIATION	STANDARD ERROR	CORR.	2-TAIL PROB.	T VALUE	DEGREES OF FREEDOM	2-TAIL PROB.
Q7												
		2.8031	1.057	.076								
	193				-.5389	1.677	.121	-.094	.194	-4.46	192	.000
		3.3420	1.204	.087								
Q8												

VARIABLE	NUMBER OF CASES	MEAN	STANDARD DEVIATION	STANDARD ERROR	(DIFFERENCE) MEAN	STANDARD DEVIATION	STANDARD ERROR	CORR.	2-TAIL PROB.	T VALUE	DEGREES OF FREEDOM	2-TAIL PROB.
Q9												
		2.9326	1.128	.081								
	193				-.9637	1.512	.109	-.035	.626	-8.84	192	.000
		3.8964	.968	.070								
Q10												

T-TEST

VARIABLE	NUMBER OF CASES	MEAN	STANDARD DEVIATION	STANDARD ERROR	(DIFFERENCE) MEAN	STANDARD DEVIATION	STANDARD ERROR	CORR.	2-TAIL PROB.	T VALUE	DEGREES OF FREEDOM	2-TAIL PROB.
Q11												
		3.0363	.959	.069								
	193				-1.0518	1.121	.081	.161	.025	-13.03	192	.000
		4.0881	.755	.054								
Q12												

ANOVA OF AFLMC SURVEY

ANALYSIS OF VARIANCE

```
07/27/83    17.58.59.    PAGE    1
     AFIT COMPUTING CENTER
     WRIGHT-PATTERSON AFB

     S P S S - - STATISTICAL PACKAGE FOR THE SOCIAL SCIENCES

     VERSION 8.3 (NOS/BE) -- MAY 04, 1982

     100000 CM MAXIMUM FIELD LENGTH REQUEST


                RUN NAME        ANOVA
                VARIABLE LIST   BASE,CND,RANK,YREXP,WTOOL
                                Q5,Q6,Q7,Q8,Q9,Q10,Q11
                                Q12,Q13,Q14,Q15,Q16
                INPUT FORMAT    FREEFIELD
                RECODE          CND('A'=1)('B'=2)('C'=3)('D'=4)('E'= 5)('F'=6)/
                                RANK('E1'=1)('E2'=2)('E3'=3)('E4'=4) ('E5'=5)('E6'=6
                                ('E7'=7)('E8'=8)('E9'=9)(ELSE=0)
                                YREXP(1 THRU 24=1)(25 THRU 84=2)
                                (85 THRU 144=3)(145 THRU HIGHEST=4)/
                                WTOOL('A'=1)('B'=2)(ELSE=0)/
                                Q5 TO Q16 ('A'=1)('B'=2)('C'=3)('D'= 4)('E'=5)(ELSE=0)
                                BASE(1 THRU 43,107 THRU 164,256 THRU  293,
                                501 THRU 542,586 THRU 602=1)
                                (44 THRU 106,165 THRU 255,294 THRU 5 00,
                                543 THRU 572,603 THRU 623,999=2)
                SELECT IF       (Q5 NE 0 AND Q6 NE 0)
                SELECT IF       (Q7 NE 0 AND Q8 NE 0)
                SELECT IF       (Q9 NE 0 AND Q10 NE 0)
                SELECT IF       (Q11 NE 0 AND Q12 NE 0)
                COMPUTE         DIFF1=Q6-Q5
                COMPUTE         DIFF2=Q8-Q7
                COMPUTE         DIFF3=Q10-Q9
                COMPUTE         DIFF4=Q12-Q11

CPU TIME REQUIRED..      .102 SECONDS


                ONEWAY          DIFF1 TO DIFF4 BY BASE(1,2)/
                                RANGES=DUNCAN
                STATISTICS      ALL

          00045200 CM NEEDED FOR ONEWAY


          OPTION - 1
          IGNORE MISSING VALUE INDICATORS
          (NO MISSING VALUES DEFINED...OPTION 1 MAY HAVE BEEN FORCED
```

FILE NONAME (CREATION DATE = 07/27/83)

- O N E W A Y -

VARIABLE DIFF1
BY BASE

ANALYSIS OF VARIANCE

SOURCE	D.F.	SUM OF SQUARES	MEAN SQUARES	F RATIO	F PROB.
BETWEEN GROUPS	1	2.1529	2.1529	1.198	.2766
WITHIN GROUPS	191	345.4015	1.8084		
TOTAL	192	347.5544			

GROUP	COUNT	MEAN	STANDARD DEVIATION	STANDARD ERROR	MINIMUM	MAXIMUM	95 PCT CONF INT FOR MEAN
GRP 1	54	1.9259	1.3577	.1848	-1.0000	4.0000	1.5553 TO 2.2965
GRP 2	139	1.6906	1.3397	.1136	-2.0000	4.0000	1.4660 TO 1.9153
TOTAL	193	1.7565			-2.0000	4.0000	
		UNGROUPED DATA	1.3454	.0968			1.5655 TO 1.9475
		FIXED EFFECTS MODEL	1.3440	.0968			1.5655 TO 1.9474
		RANDOM EFFECTS MODEL	.1558	.1096			.3638 TO 3.1492

RANDOM EFFECTS MODEL - ESTIM. OF BETWEEN COMPONENT VARIANCE .0044

TESTS FOR HOMOGENEITY OF VARIANCES

COCHRANS C = MAX.VARIANCE/SUM(VARIANCES) = .5067, P = .896 (APPROX.)
BARTLETT-BOX F = .014, P = .987
MAXIMUM VARIANCE / MINIMUM VARIANCE = 1.027

FILE NONAME (CREATION DATE = 07/27/83)

----------ONEWAY----------

VARIABLE DIFF1

MULTIPLE RANGE TEST

DUNCAN PROCEDURE
RANGES FOR THE .050 LEVEL -

2.79

THE RANGES ABOVE ARE TABULAR VALUES.
THE VALUE ACTUALLY COMPARED WITH MEAN(J)-MEAN(I) IS..
.9589 * RANGE * SQRT(1/N(I) + 1/N(J))

HOMOGENEOUS SUBSETS (SUBSETS OF GROUPS, WHOSE HIGHEST AND LOWEST MEANS DO NOT DIFFER BY MORE THAN THE SHORTEST SIGNFICANT RANGE FOR A SUBSET OF THAT SIZE)

SUBSET 1

GROUP	GRP 2	GRP 1
MEAN	1.6986	1.9259

FILE NONAME (CREATION DATE = 07/27/83)

- ONEWAY -

VARIABLE DIFF2
BY BASE

ANALYSIS OF VARIANCE

SOURCE	D.F.	SUM OF SQUARES	MEAN SQUARES	F RATIO	F PROB.
BETWEEN GROUPS	1	43.0158	43.0158	16.533	.0001
WITHIN GROUPS	191	496.9427	2.6018		
TOTAL	192	539.9585			

GROUP	COUNT	MEAN	STANDARD DEVIATION	STANDARD ERROR	MINIMUM	MAXIMUM	95 PCT CONF INT FOR MEAN
GRP 1	54	1.2963	1.2074	.1643	-1.0000	4.0000	.9668 TO 1.6258
GRP 2	139	.2446	1.7439	.1479	-4.0000	4.0000	-.0479 TO .5371
TOTAL	193	.5389			-4.0000	4.0000	
	UNGROUPED DATA		1.6770	.1207			.3008 TO .7770
	FIXED EFFECTS MODEL		1.6130	.1161			.3098 TO .7679
	RANDOM EFFECTS MODEL		.8046	.5609			-6.6898 TO 7.7676

RANDOM EFFECTS MODEL - ESTIM. OF BETWEEN COMPONENT VARIANCE .5196

TESTS FOR HOMOGENEITY OF VARIANCES

COCHRANS C = MAX.VARIANCE/SUM(VARIANCES) = .6768, P = .000 (APPROX.)
BARTLETT-BOX F = 9.108, P = .003
MAXIMUM VARIANCE / MINIMUM VARIANCE = 2.086

- -

FILE MDNAME (CREATION DATE = 07/27/83)

----------ONEWAY----------

VARIABLE DIFF2

MULTIPLE RANGE TEST

DUNCAN PROCEDURE
RANGES FOR THE .050 LEVEL -

2.79

THE RANGES ABOVE ARE TABULAR VALUES.
THE VALUE ACTUALLY COMPARED WITH MEAN(J)-MEAN(I) IS..
1.1406 * RANGE * SQRT(1/N(I) + 1/N(J))

HOMOGENEOUS SUBSETS (SUBSETS OF GROUPS, WHOSE HIGHEST AND LOWEST MEANS DO NOT DIFFER BY MORE THAN THE SHORTEST SIGNFICANT RANGE FOR A SUBSET OF THAT SIZE)

SUBSET 1

GROUP	GRP 2
MEAN	.2446

SUBSET 2

GROUP	GRP 1
MEAN	1.2963

NNUAN
07/27/83 17.50.59. PAGE 6

FILE NONAME (CREATION DATE = 07/27/83)

- O N E W A Y -

VARIABLE DIFF3
BY BASE

ANALYSIS OF VARIANCE

SOURCE	D.F.	SUM OF SQUARES	MEAN SQUARES	F RATIO	F PROB.
BETWEEN GROUPS	1	13.5531	13.5531	6.088	.0145
WITHIN GROUPS	191	425.1930	2.2261		
TOTAL	192	438.7461			

GROUP	COUNT	MEAN	STANDARD DEVIATION	STANDARD ERROR	MINIMUM	MAXIMUM	95 PCT CONF INT FOR MEAN
GRP 1	54	1.3889	1.3517	.1839	-1.0000	4.0000	1.0200 TO 1.7578
GRP 2	139	.7986	1.5425	.1308	-4.0000	4.0000	.5399 TO 1.0573
TOTAL	193	.9637			-4.0000	4.0000	
UNGROUPED DATA			1.5117	.1088			.7491 TO 1.1784
FIXED EFFECTS MODEL			1.4920	.1074			.7519 TO 1.1756
RANDOM EFFECTS MODEL			.4430	.3130			-3.0234 TO 4.9509

RANDOM EFFECTS MODEL - ESTIM. OF BETWEEN COMPONENT VARIANCE .1456

TESTS FOR HOMOGENEITY OF VARIANCES

COCHRANS C = MAX.VARIANCE/SUM(VARIANCES) = .5657, P = .197 (APPROX.)
BARTLETT-BOX F = 1.273, P = .259
MAXIMUM VARIANCE / MINIMUM VARIANCE = 1.302

- -

FILE NONAME (CREATION DATE = 07/27/83)

----------ONEWAY----------

VARIABLE DIFF3

MULTIPLE RANGE TEST

DUNCAN PROCEDURE
RANGES FOR THE .050 LEVEL -

2.79

THE RANGES ABOVE ARE TABULAR VALUES.
THE VALUE ACTUALLY COMPARED WITH MEAN(J)-MEAN(I) IS..
1.0550 * RANGE * SQRT(1/N(I) + 1/N(J))

HOMOGENEOUS SUBSETS (SUBSETS OF GROUPS, WHOSE HIGHEST AND LOWEST MEANS DO NOT DIFFER BY MORE THAN THE SHORTEST SIGNIFICANT RANGE FOR A SUBSET OF THAT SIZE)

SUBSET 1

GROUP	GRP 2
MEAN	.7986

SUBSET 2

GROUP	GRP 1
MEAN	1.3089

ANOVA
07/27/83 17.50.59. PAGE 8

FILE NONAME (CREATION DATE = 07/27/83)

- O N E W A Y -

VARIABLE DIFF4
BY BASE

ANALYSIS OF VARIANCE

SOURCE	D.F.	SUM OF SQUARES	MEAN SQUARES	F RATIO	F PROB.
BETWEEN GROUPS	1	7.6087	7.6087	6.214	.0135
WITHIN GROUPS	191	233.8732	1.2245		
TOTAL	192	241.4819			

GROUP	COUNT	MEAN	STANDARD DEVIATION	STANDARD ERROR	MINIMUM	MAXIMUM	95 PCT CONF INT FOR MEAN		
GRP 1	54	1.3704	1.1863	.1614	0	4.0000	1.0466	TO	1.6942
GRP 2	139	.9281	1.0743	.0911	-2.0000	4.0000	.7479	TO	1.1082
TOTAL	193	1.0518			-2.0000	4.0000			
		UNGROUPED DATA	1.1215	.0807			.8926	TO	1.2110
		FIXED EFFECTS MODEL	1.1066	.0797			.8947	TO	1.2089
		RANDOM EFFECTS MODEL	.3327	.2353			-1.9373	TO	4.0410

RANDOM EFFECTS MODEL - ESTIM. OF BETWEEN COMPONENT VARIANCE .0821

TESTS FOR HOMOGENEITY OF VARIANCES

COCHRANS C = MAX.VARIANCE/SUM(VARIANCES) = .5494, P = .333 (APPROX.)
BARTLETT-BOX F = .769, P = .381
MAXIMUM VARIANCE / MINIMUM VARIANCE = 1.219

- -

FILE NONAME (CREATION DATE = 07/27/83)

----------ONEWAY----------

VARIABLE DIFF4

MULTIPLE RANGE TEST

DUNCAN PROCEDURE
RANGES FOR THE .050 LEVEL -

2.79

THE RANGES ABOVE ARE TABULAR VALUES.
THE VALUE ACTUALLY COMPARED WITH MEAN(J)-MEAN(I) IS..
.7825 * RANGE * SQRT(1/N(I) + 1/N(J))

HOMOGENEOUS SUBSETS (SUBSETS OF GROUPS, WHOSE HIGHEST AND LOWEST MEANS DO NOT DIFFER BY MORE THAN THE SHORTEST SIGNIFICANT RANGE FOR A SUBSET OF THAT SIZE)

SUBSET 1

GROUP	GRP 2
MEAN	.9281

SUBSET 2

GROUP	GRP 1
MEAN	1.3784

CPU TIME REQUIRED.. 1.043 SECONDS

```
ONEWAY      DIFF1 TO DIFF4 BY CND(1,6)/
            RANGES=DUNCAN
STATISTICS  ALL
```

00043100 CM NEEDED FOR ONEWAY

OPTION - 1
IGNORE MISSING VALUE INDICATORS
(NO MISSING VALUES DEFINED...OPTION 1 MAY HAVE BEEN FORCED

HMUAA
07/27/83 17.50.59. PAGE 11

FILE NONAME (CREATION DATE = 07/27/83)

- O N E W A Y -

VARIABLE DIFF1
BY CHD

ANALYSIS OF VARIANCE

SOURCE	D.F.	SUM OF SQUARES	MEAN SQUARES	F RATIO	F PROB.
BETWEEN GROUPS	4	9.6030	2.4007	1.336	.2583
WITHIN GROUPS	188	337.9514	1.7976		
TOTAL	192	347.5544			

GROUP	COUNT	MEAN	STANDARD DEVIATION	STANDARD ERROR	MINIMUM	MAXIMUM	95 PCT CONF INT FOR MEAN
GRP 1	95	1.8211	1.3989	.1435	-2.0000	4.0000	1.5361 TO 2.1060
GRP 2	11	1.6364	1.5015	.4527	0	4.0000	.6276 TO 2.6451
GRP 3	73	1.6438	1.2624	.1478	-1.0000	4.0000	1.3493 TO 1.9384
GRP 4	8	1.3750	1.3025	.4605	-1.0000	3.0000	.2861 TO 2.4639
GRP 6	6	2.0333	.9832	.4014	1.0000	4.0000	1.0016 TO 3.0651
TOTAL	193	1.7565			-2.0000	4.0000	
UNGROUPED DATA			1.3454	.0968			1.5655 TO 1.9475
FIXED EFFECTS MODEL			1.3408	.0965			1.5661 TO 1.9469
RANDOM EFFECTS MODEL			.2945	.1317			1.3908 TO 2.1222

RANDOM EFFECTS MODEL - ESTIM. OF BETWEEN COMPONENT VARIANCE .0205

TESTS FOR HOMOGENEITY OF VARIANCES

COCHRANS C = MAX.VARIANCE/SUM(VARIANCES) = .2662, P = .302 (APPROX.)
BARTLETT-BOX F = .464, P = .762
MAXIMUM VARIANCE / MINIMUM VARIANCE = 2.332

- -

FILE NONAME (CREATION DATE = 07/27/83)

---------- ONEWAY ----------

VARIABLE DIFF1

MULTIPLE RANGE TEST

DUNCAN PROCEDURE
RANGES FOR THE .050 LEVEL -

2.79 2.94 3.03 3.10

THE RANGES ABOVE ARE TABULAR VALUES.
THE VALUE ACTUALLY COMPARED WITH MEAN(J)-MEAN(I) IS..
.9481 * RANGE * SQRT(1/N(I) + 1/N(J))

HOMOGENEOUS SUBSETS (SUBSETS OF GROUPS, WHOSE HIGHEST AND LOWEST MEANS DO NOT DIFFER BY MORE THAN THE SHORTEST SIGNIFICANT RANGE FOR A SUBSET OF THAT SIZE)

SUBSET 1

GROUP	GRP 4	GRP 2	GRP 3	GRP 1	GRP 6
MEAN	1.3750	1.4364	1.4438	1.8211	2.8333

ANOVA
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FILE NONAME (CREATION DATE = 07/27/83)

- O N E W A Y -

VARIABLE DIFF2
BY CMD

ANALYSIS OF VARIANCE

SOURCE	D.F.	SUM OF SQUARES	MEAN SQUARES	F RATIO	F PROB.
BETWEEN GROUPS	4	63.2725	15.8181	6.239	.0001
WITHIN GROUPS	188	476.6861	2.5356		
TOTAL	192	539.9585			

GROUP	COUNT	MEAN	STANDARD DEVIATION	STANDARD ERROR	MINIMUM	MAXIMUM	95 PCT CONF INT FOR MEAN
GRP 1	95	.7474	1.4944	.1533	-3.0000	4.0000	.4429 TO 1.0518
GRP 2	11	1.3636	1.5015	.4527	-1.0000	4.0000	.3549 TO 2.3724
GRP 3	73	-.0959	1.7963	.2102	-4.0000	3.0000	-.5150 TO .3232
GRP 4	8	1.6250	.7440	.2631	1.0000	3.0000	1.0030 TO 2.2470
GRP 6	6	2.0000	1.2649	.5164	0	3.0000	.6726 TO 3.3274
TOTAL	193	.5389			-4.0000	4.0000	
UNGROUPED DATA			1.6770	.1207			.3008 TO .7770
FIXED EFFECTS MODEL			1.5923	.1146			.3120 TO .7658
RANDOM EFFECTS MODEL			.9749	.4360			-.6716 TO 1.7494

RANDOM EFFECTS MODEL - ESTIM. OF BETWEEN COMPONENT VARIANCE .4522

TESTS FOR HOMOGENEITY OF VARIANCES

COCHRANS C = MAX.VARIANCE/SUM(VARIANCES) = .3270, P = .013 (APPROX.)
BARTLETT-BOX F = 2.097, P = .079
MAXIMUM VARIANCE / MINIMUM VARIANCE = 5.829

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ANOVA
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FILE NONAME (CREATION DATE = 07/27/83)

---------- O N E W A Y ----------

VARIABLE DIFF2

MULTIPLE RANGE TEST

DUNCAN PROCEDURE
RANGES FOR THE .050 LEVEL -

2.79 2.94 3.03 3.10

THE RANGES ABOVE ARE TABULAR VALUES.
THE VALUE ACTUALLY COMPARED WITH MEAN(J)-MEAN(I) IS..
1.1260 * RANGE * SQRT(1/N(I) + 1/N(J))

HOMOGENEOUS SUBSETS (SUBSETS OF GROUPS, WHOSE HIGHEST AND LOWEST MEANS DO NOT DIFFER BY MORE THAN THE SHORTEST SIGNIFICANT RANGE FOR A SUBSET OF THAT SIZE)

SUBSET 1

GROUP	GRP 3
MEAN	-.6959

SUBSET 2

GROUP	GRP 1	GRP 2	GRP 4	GRP 6
MEAN	.7474	1.3434	1.4250	2.0000

FILE NONAME (CREATION DATE = 07/27/83)

- O N E W A Y -

VARIABLE DIFF3
By CND

ANALYSIS OF VARIANCE

SOURCE	D.F.	SUM OF SQUARES	MEAN SQUARES	F RATIO	F PROB.
BETWEEN GROUPS	4	27.3255	6.8314	3.122	.0162
WITHIN GROUPS	188	411.4206	2.1884		
TOTAL	192	438.7461			

GROUP	COUNT	MEAN	STANDARD DEVIATION	STANDARD ERROR	MINIMUM	MAXIMUM	95 PCT CONF INT FOR MEAN
GRP 1	95	1.2421	1.6298	.1671	-3.0000	4.0000	.9103 TO 1.5739
GRP 2	11	1.0909	1.0445	.3149	0	3.0000	.3892 TO 1.7926
GRP 3	73	.5068	1.3458	.1574	-4.0000	4.0000	.1930 TO .8207
GRP 4	8	1.0000	1.1952	.4226	0	3.0000	.0008 TO 1.9992
GRP 6	6	1.8333	1.4720	.6009	0	4.0000	.2886 TO 3.3780
TOTAL	193	.9637			-4.0000	4.0000	
	UNGROUPED DATA		1.5117	.1088			.7491 TO 1.1784
	FIXED EFFECTS MODEL		1.4793	.1065			.7537 TO 1.1738
	RANDOM EFFECTS MODEL		.6458	.2785			.2126 TO 1.7149

RANDOM EFFECTS MODEL - ESTIM. OF BETWEEN COMPONENT VARIANCE .1581

TESTS FOR HOMOGENEITY OF VARIANCES

COCHRANS C = MAX.VARIANCE/SUM(VARIANCES) = .2998, P = .181 (APPROX.)
BARTLETT-BOX F = 1.346, P = .251
MAXIMUM VARIANCE / MINIMUM VARIANCE = 2.432

- -

FILE NONAME (CREATION DATE = 07/27/83)

----------ONEWAY----------

VARIABLE DIFF3

MULTIPLE RANGE TEST

DUNCAN PROCEDURE
RANGES FOR THE .050 LEVEL -

2.79 2.94 3.03 3.10

THE RANGES ABOVE ARE TABULAR VALUES.
THE VALUE ACTUALLY COMPARED WITH MEAN(J)-MEAN(I) IS..
1.0460 * RANGE * SQRT(1/N(I) + 1/N(J))

HOMOGENEOUS SUBSETS (SUBSETS OF GROUPS, WHOSE HIGHEST AND LOWEST MEANS DO NOT DIFFER BY MORE THAN THE SHORTEST SIGNIFICANT RANGE FOR A SUBSET OF THAT SIZE)

SUBSET 1

GROUP	GRP 3	GRP 4	GRP 2	GRP 1	GRP 6
MEAN	.5040	1.0000	1.0909	1.2421	1.6333

FILE NONAME (CREATION DATE = 07/27/83)

- O N E W A Y -

VARIABLE DIFF4
BY CYD

ANALYSIS OF VARIANCE

SOURCE	D.F.	SUM OF SQUARES	MEAN SQUARES	F RATIO	F PROB.
BETWEEN GROUPS	4	28.1092	7.0273	6.212	.0001
WITHIN GROUPS	188	213.2927	1.1345		
TOTAL	192	241.4019			

GROUP	COUNT	MEAN	STANDARD DEVIATION	STANDARD ERROR	MINIMUM	MAXIMUM	95 PCT CONF INT FOR MEAN
GRP 1	95	1.1895	1.1137	.1143	-1.0000	4.0000	.9626 TO 1.4163
GRP 2	11	1.0000	.6325	.1907	0	2.0000	.5751 TO 1.4249
GRP 3	73	.6986	1.0499	.1229	-2.0000	4.0000	.4537 TO .9436
GRP 4	8	1.5000	1.0690	.3780	0	3.0000	.6063 TO 2.3937
GRP 6	6	2.6667	1.0328	.4216	1.0000	4.0000	1.5828 TO 3.7505
TOTAL	193	1.0518			-2.0000	4.0000	
		UNGROUPED DATA	1.1215	.0807			.0926 TO 1.2110
		FIXED EFFECTS MODEL	1.0651	.0767			.9006 TO 1.2031
		RANDOM EFFECTS MODEL	.6504	.2909			.2440 TO 1.8596

RANDOM EFFECTS MODEL - ESTIM. OF BETWEEN COMPONENT VARIANCE .2013

TESTS FOR HOMOGENEITY OF VARIANCES

COCHRANS C = MAX.VARIANCE/SUM(VARIANCES) = .2585, P = .545 (APPROX.)
BARTLETT-BOX F = 1.053, P = .379
MAXIMUM VARIANCE / MINIMUM VARIANCE = 3.101

- -

FILE NONAME (CREATION DATE = 07/27/83)

----------ONEWAY----------

VARIABLE DIFF4

MULTIPLE RANGE TEST

DUNCAN PROCEDURE
RANGES FOR THE .050 LEVEL -

2.79 2.94 3.03 3.10

THE RANGES ABOVE ARE TABULAR VALUES.
THE VALUE ACTUALLY COMPARED WITH MEAN(J)-MEAN(I) IS..
.7532 * RANGE * SQRT(1/N(I) + 1/N(J))

HOMOGENEOUS SUBSETS (SUBSETS OF GROUPS, WHOSE HIGHEST AND LOWEST MEANS DO NOT DIFFER BY MORE THAN THE SHORTEST SIGNIFICANT RANGE FOR A SUBSET OF THAT SIZE)

SUBSET 1

GROUP	GRP 3	GRP 2	GRP 1	GRP 4
MEAN	.6986	1.0060	1.1895	1.5800

SUBSET 2

GROUP	GRP 6
MEAN	2.6667

CPU TIME REQUIRED.. .147 SECONDS

```
        ONEWAY      DIFF1 TO DIFF4 BY Rank(1,10)/
                    RANGES=DUNCAN
        STATISTICS  ALL

0004320B CM NEEDED FOR ONEWAY


OPTION - 1
IGNORE MISSING VALUE INDICATORS
(NO MISSING VALUES DEFINED...OPTION 1 MAY HAVE BEEN FORCED)
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FILE NONAME (CREATION DATE = 07/27/83)

- O N E W A Y -

VARIABLE DIFF1
BY rank

ANALYSIS OF VARIANCE

SOURCE	D.F.	SUM OF SQUARES	MEAN SQUARES	F RATIO	F PROB.
BETWEEN GROUPS	6	6.8616	1.1436	.626	.7092
WITHIN GROUPS	184	336.0599	1.82e4		
TOTAL	190	342.9215			

GROUP	COUNT	MEAN	STANDARD DEVIATION	STANDARD ERROR	MINIMUM	MAXIMUM	95 PCT CONF INT FOR MEAN
GRP 1	3	1.3333	1.5275	.8819	0	3.0000	-2.4613 TO 5.1280
GRP 2	3	1.3333	.5774	.3333	1.0000	2.0000	-.1009 TO 2.7676
GRP 3	76	1.6711	1.3989	.1605	-2.0000	4.0000	1.3514 TO 1.9907
GRP 4	42	1.9048	1.1221	.1731	0	4.0000	1.5551 TO 2.2544
GRP 5	52	1.6731	1.4379	.1994	-1.0000	4.0000	1.2728 TO 2.0734
GRP 6	9	2.2222	1.3017	.4339	1.0000	4.0000	1.2216 TO 3.2228
GRP 7	6	2.3333	1.6330	.6667	0	4.0000	.6196 TO 4.0470
TOTAL	191	1.7592			-2.0000	4.0000	
		UNGROUPED DATA	1.3434	.0972			1.5674 TO 1.9589
		FIXED EFFECTS MODEL	1.3514	.0978			1.5662 TO 1.9521
		RANDOM EFFECTS MODEL	.2587	.0978			1.5199 TO 1.9984

RANDOM EFFECTS MODEL - ESTIM. OF BETWEEN COMPONENT VARIANCE -.0300

TESTS FOR HOMOGENEITY OF VARIANCES

COCHRANS C = MAX.VARIANCE/SUM(VARIANCES) = .21##, P = .222 (APPROX.)
BARTLETT-BOX F = .831, P = .546
MAXIMUM VARIANCE / MINIMUM VARIANCE = 0.000

FILE NONAME (CREATION DATE = 07/27/83) 21

----------ONEWAY----------

VARIABLE DIFF1

MULTIPLE RANGE TEST

DUNCAN PROCEDURE
RANGES FOR THE .050 LEVEL -

2.80 2.94 3.03 3.10 3.16 3.21

THE RANGES ABOVE ARE TABULAR VALUES.
THE VALUE ACTUALLY COMPARED WITH MEAN(J)-MEAN(I) IS..
.7556 * RANGE * SQRT(1/N(I) + 1/N(J))

HOMOGENEOUS SUBSETS (SUBSETS OF GROUPS, WHOSE HIGHEST AND LOWEST MEANS DO NOT DIFFER BY MORE THAN THE SHORTEST SIGNFICANT RANGE FOR A SUBSET OF THAT SIZE)

SUBSET 1

GROUP	GRP 1	GRP 2	GRP 3	GRP 5	GRP 4	GRP 6	GRP 7
MEAN	1.3333	1.3333	1.6711	1.6731	1.9048	2.2222	2.3333

FILE NONAME (CREATION DATE = 07/27/83)

- O N E W A Y -

VARIABLE DIFF2
BY RANK

ANALYSIS OF VARIANCE

SOURCE	D.F.	SUM OF SQUARES	MEAN SQUARES	F RATIO	F PROB.
BETWEEN GROUPS	6	31.6859	5.2810	1.936	.0772
WITHIN GROUPS	184	501.9058	2.7277		
TOTAL	190	533.5914			

GROUP	COUNT	MEAN	STANDARD DEVIATION	STANDARD ERROR	MINIMUM	MAXIMUM	95 PCT CONF INT FOR MEAN
GRP 1	3	0	2.6458	1.5275	-3.0000	2.0000	-6.5725 TO 6.5725
GRP 2	3	1.3333	.5774	.3333	1.0000	2.0000	-.1069 TO 2.7676
GRP 3	76	.3947	1.6890	.1846	-4.0000	4.0000	.0271 TO .7624
GRP 4	42	.3333	1.5249	.2353	-4.0000	3.0000	-.1418 TO .8085
GRP 5	52	.5769	1.8508	.2567	-3.0000	4.0000	.0617 TO 1.0922
GRP 6	9	2.2222	.8333	.2778	1.0000	3.0000	1.5817 TO 2.8628
GRP 7	6	.5000	1.0788	.7638	-2.0000	3.0000	-1.4633 TO 2.4633
TOTAL	191	.5288			-4.0000	4.0000	
		UNGROUPED DATA	1.6758	.1213			.2896 TO .7680
		FIXED EFFECTS MODEL	1.6516	.1195			.2938 TO .7646
		RANDOM EFFECTS MODEL	.5685	.2149			.0030 TO 1.0546

RANDOM EFFECTS MODEL - ESTIM. OF BETWEEN COMPONENT VARIANCE .1121

TESTS FOR HOMOGENEITY OF VARIANCES

COCHRANS C = MAX.VARIANCE/SUM(VARIANCES) = .3523, P = .000 (APPROX.)
BARTLETT-BOX F = 1.689, P = .120
MAXIMUM VARIANCE / MINIMUM VARIANCE = 21.000

FILE NONAME (CREATION DATE = 07/27/83)

ONEWAY

VARIABLE DIFF2

MULTIPLE RANGE TEST

DUNCAN PROCEDURE
RANGES FOR THE .050 LEVEL -

2.80 2.94 3.03 3.10 3.16 3.21

THE RANGES ABOVE ARE TABULAR VALUES.
THE VALUE ACTUALLY COMPARED WITH MEAN(J)-MEAN(I) IS..
1.1679 * RANGE * SQRT(1/N(I) + 1/N(J))

HOMOGENEOUS SUBSETS (SUBSETS OF GROUPS, WHOSE HIGHEST AND LOWEST MEANS DO NOT DIFFER BY MORE THAN THE SHORTEST SIGNIFICANT RANGE FOR A SUBSET OF THAT SIZE)

SUBSET 1

GROUP	GRP 1	GRP 4	GRP 3	GRP 7	GRP 5	GRP 2	GRP 6
MEAN	0	.3333	.3947	.5000	.5749	1.3333	2.2222

FILE NONAME (CREATION DATE = 07/27/83) 24

----------ONEWAY----------

VARIABLE DIFF3
BY Anna

ANALYSIS OF VARIANCE

SOURCE	D.F.	SUM OF SQUARES	MEAN SQUARES	F RATIO	F PROB.
BETWEEN GROUPS	6	13.1741	2.1957	.954	.4588
WITHIN GROUPS	184	423.5694	2.3020		
TOTAL	190	436.7435			

GROUP	COUNT	MEAN	STANDARD DEVIATION	STANDARD ERROR	MINIMUM	MAXIMUM	95 PCT CONF INT FOR MEAN
GRP 1	3	0	1.0000	.5774	-1.0000	1.0000	-2.4842 TO 2.4842
GRP 2	3	1.6667	1.5275	.8819	0	3.0000	-2.1280 TO 5.4613
GRP 3	76	.9342	1.5692	.1800	-4.0000	4.0000	.5756 TO 1.2928
GRP 4	42	.7143	1.5662	.2417	-3.0000	4.0000	.2262 TO 1.2023
GRP 5	52	1.0577	1.5065	.2081	-2.0000	4.0000	.6399 TO 1.4754
GRP 6	9	1.3333	1.0000	.3333	0	3.0000	.5647 TO 2.1020
GRP 7	6	1.8333	1.3292	.5426	0	4.0000	.4385 TO 3.2282
TOTAL	191	.9634			-4.0000	4.0000	
	UNGROUPED DATA		1.5161	.1097			.7470 TO 1.1797
	FIXED EFFECTS MODEL		1.5172	.1098			.7468 TO 1.1799
	RANDOM EFFECTS MODEL		.2985	.1098			.6947 TO 1.2320

RANDOM EFFECTS MODEL - ESTIM. OF BETWEEN COMPONENT VARIANCE -.8047

TESTS FOR HOMOGENEITY OF VARIANCES

COCHRANS C = MAX.VARIANCE/SUM(VARIANCES) = .1856, P = .874 (APPROX.)
BARTLETT-BOX F = .481, P = .823
MAXIMUM VARIANCE / MINIMUM VARIANCE = 2.442

FILE NONAME (CREATION DATE = 07/27/83)

ONEWAY

VARIABLE DIFF3

MULTIPLE RANGE TEST

DUNCAN PROCEDURE
RANGES FOR THE .050 LEVEL -

2.80 2.94 3.03 3.10 3.16 3.21

THE RANGES ABOVE ARE TABULAR VALUES.
THE VALUE ACTUALLY COMPARED WITH MEAN(J)-MEAN(I) IS..
1.0728 * RANGE * SQRT(1/N(I) + 1/N(J))

HOMOGENEOUS SUBSETS (SUBSETS OF GROUPS, WHOSE HIGHEST AND LOWEST MEANS DO NOT DIFFER BY MORE THAN THE SHORTEST SIGNIFICANT RANGE FOR A SUBSET OF THAT SIZE)

SUBSET 1

GROUP	GRP 1	GRP 4	GRP 3	GRP 5	GRP 6	GRP 2	GRP 7
MEAN	0	.7143	.9342	1.0577	1.3333	1.6667	1.8333

FILE NONAME (CREATION DATE = 07/27/83)

- O N E W A Y -

VARIABLE DIFF4
BY RANK

ANALYSIS OF VARIANCE

SOURCE	D.F.	SUM OF SQUARES	MEAN SQUARES	F RATIO	F PROB.
BETWEEN GROUPS	6	20.6818	3.4470	2.930	.0092
WITHIN GROUPS	184	215.6941	1.1733		
TOTAL	190	236.3759			

GROUP	COUNT	MEAN	STANDARD DEVIATION	STANDARD ERROR	MINIMUM	MAXIMUM	95 PCT CONF INT FOR MEAN
GRP 1	3	.6667	.5774	.3333	0	1.0000	-.7676 TO 2.1009
GRP 2	3	.3333	.5774	.3333	0	1.0000	-1.1009 TO 1.7676
GRP 3	74	1.0395	1.1008	.1263	-2.0000	4.0000	.7879 TO 1.2910
GRP 4	42	.8095	1.3313	.1746	-1.0000	4.0000	.4578 TO 1.1621
GRP 5	52	1.0192	.9998	.1386	-1.0000	4.0000	.7409 TO 1.2976
GRP 6	9	1.0889	1.2693	.4231	0	4.0000	.9132 TO 2.8646
GRP 7	6	2.3333	1.2111	.4944	1.0000	4.0000	1.0624 TO 3.6042
TOTAL	191	1.0471			-2.0000	4.0000	
		UNGROUPED DATA	1.1159	.0807			.8879 TO 1.2064
		FIXED EFFECTS MODEL	1.0832	.0784			.8925 TO 1.2018
		RANDOM EFFECTS MODEL	.4917	.1059			.5923 TO 1.5019

RANDOM EFFECTS MODEL - ESTIM. OF BETWEEN COMPONENT VARIANCE .0998

TESTS FOR HOMOGENEITY OF VARIANCES

COCHRANS C = MAX.VARIANCE/SUM(VARIANCES) = .2227, P = .163 (APPROX.)
BARTLETT-BOX F = .552, P = .769
MAXIMUM VARIANCE / MINIMUM VARIANCE = 4.833

FILE NONAME (CREATION DATE = 07/27/83) 27

ONEWAY

VARIABLE DIFF4

MULTIPLE RANGE TEST

DUNCAN PROCEDURE
RANGES FOR THE .050 LEVEL -

2.80 2.94 3.03 3.10 3.16 3.21

THE RANGES ABOVE ARE TABULAR VALUES.
THE VALUE ACTUALLY COMPARED WITH MEAN(J)-MEAN(I) IS..
.7659 * RANGE * SQRT(1/N(I) + 1/N(J))

HOMOGENEOUS SUBSETS (SUBSETS OF GROUPS, WHOSE HIGHEST AND LOWEST MEANS DO NOT DIFFER BY MORE THAN THE SHORTEST SIGNIFICANT RANGE FOR A SUBSET OF THAT SIZE)

SUBSET 1

GROUP	GRP 2	GRP 1	GRP 4	GRP 5	GRP 3	GRP 6
MEAN	.3333	.6667	.8095	1.0192	1.0395	1.0889

SUBSET 2

GROUP	GRP 1	GRP 4	GRP 5	GRP 3	GRP 6	GRP 7
MEAN	.6667	.8095	1.0192	1.0395	1.0889	2.3333

CPU TIME REQUIRED.. .15a SECONDS

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            ONEWAY      DIFF1 TO DIFF4 BY YREXP(1,0)/
                        RANGES=DUNCAN
            STATISTICS  ALL
            READ INPUT DATA
```

8004;000 CM NEEDED FOR ONEWAY

OPTION - 1
IGNORE MISSING VALUE INDICATORS
(NO MISSING VALUES DEFINED...OPTION 1 MAY HAVE BEEN FORCED)

---------- O N E W A Y ----------

VARIABLE DIFF1
By YREAP

ANALYSIS OF VARIANCE

SOURCE	D.F.	SUM OF SQUARES	MEAN SQUARES	F RATIO	F PROB.
BETWEEN GROUPS	3	3.6814	1.2271	.674	.5687
WITHIN GROUPS	189	343.8730	1.8194		
TOTAL	192	347.5544			

GROUP	COUNT	MEAN	STANDARD DEVIATION	STANDARD ERROR	MINIMUM	MAXIMUM	95 PCT CONF INT FOR MEAN
GRP 1	68	1.6324	1.3033	.1581	-1.0000	4.0000	1.3169 TO 1.9478
GRP 2	83	1.8313	1.3599	.1493	-2.0000	4.0000	1.5344 TO 2.1283
GRP 3	23	1.6087	1.3731	.2863	-1.0000	4.0000	1.0149 TO 2.2025
GRP 4	19	2.0526	1.4327	.3287	0	4.0000	1.3621 TO 2.7432
TOTAL	193	1.7565			-2.0000	4.0000	
	UNGROUPED DATA		1.3454	.0968			1.5655 TO 1.9475
	FIXED EFFECTS MODEL		1.3489	.0971			1.5650 TO 1.9480
	RANDOM EFFECTS MODEL		.1942	.0971			1.4475 TO 2.0655

RANDOM EFFECTS MODEL - ESTIM. OF BETWEEN COMPONENT VARIANCE -.0138

TESTS FOR HOMOGENEITY OF VARIANCES

COCHRANS C = MAX.VARIANCE/SUM(VARIANCES) = .2742, P = 1.000 (APPROX.)
BARTLETT-BOX F = .104, P = .958
MAXIMUM VARIANCE / MINIMUM VARIANCE = 1.208

FILE NONAME (CREATION DATE = 07/27/83)

----------ONEWAY----------

VARIABLE DIFF1

MULTIPLE RANGE TEST

DUNCAN PROCEDURE
RANGES FOR THE .050 LEVEL -

2.79 2.94 3.03

THE RANGES ABOVE ARE TABULAR VALUES.
THE VALUE ACTUALLY COMPARED WITH MEAN(J)-MEAN(I) IS..
.9530 * RANGE * SQRT(1/N(I) + 1/N(J))

HOMOGENEOUS SUBSETS (SUBSETS OF GROUPS, WHOSE HIGHEST AND LOWEST MEANS DO NOT DIFFER BY MORE THAN THE SHORTEST SIGNIFICANT RANGE FOR A SUBSET OF THAT SIZE)

SUBSET 1

GROUP	GRP 3	GRP 1	GRP 2	GRP 4
MEAN	1.6087	1.6324	1.8313	2.0526

FILE NONAME (CREATION DATE = 07/27/83)

- ONEWAY -

VARIABLE DIFF2
BY VREXP

ANALYSIS OF VARIANCE

SOURCE	D.F.	SUM OF SQUARES	MEAN SQUARES	F RATIO	F PROB.
BETWEEN GROUPS	3	16.7526	5.5842	2.017	.1130
WITHIN GROUPS	189	523.2059	2.7683		
TOTAL	192	539.9585			

GROUP	COUNT	MEAN	STANDARD DEVIATION	STANDARD ERROR	MINIMUM	MAXIMUM	95 PCT CONF INT FOR MEAN
GRP 1	48	.4118	1.6412	.1990	-4.0000	4.0000	.0145 TO .8091
GRP 2	83	.3976	1.7032	.1870	-4.0000	4.0000	.0257 TO .7695
GRP 3	23	.7391	1.6846	.3513	-3.0000	4.0000	.0106 TO 1.4676
GRP 4	19	1.3684	1.5352	.3522	-2.0000	3.0000	.6285 TO 2.1083
TOTAL	193	.5389			-4.0000	4.0000	
UNGROUPED DATA			1.6770	.1207			.3000 TO .7778
FIXED EFFECTS MODEL			1.6630	.1198			.3026 TO .7751
RANDOM EFFECTS MODEL			.3005	.1902			-.0666 TO 1.1443

RANDOM EFFECTS MODEL - ESTIM. OF BETWEEN COMPONENT VARIANCE .0456

TESTS FOR HOMOGENEITY OF VARIANCES

COCHRANS C = MAX.VARIANCE/SUM(VARIANCES) = .2689, P = 1.000 (APPROX.)
BARTLETT-BOX F = .113, P = .952
MAXIMUM VARIANCE / MINIMUM VARIANCE = 1.231

- -

FILE NONAME (CREATION DATE = 07/27/83)

----------ONEWAY----------

VARIABLE DIFF2

MULTIPLE RANGE TEST

DUNCAN PROCEDURE
RANGES FOR THE .050 LEVEL -

2.79 2.94 3.03

THE RANGES ABOVE ARE TABULAR VALUES.
THE VALUE ACTUALLY COMPARED WITH MEAN(J)-MEAN(I) IS..
1.1765 * RANGE * SQRT(1/N(I) + 1/N(J))

HOMOGENEOUS SUBSETS (SUBSETS OF GROUPS, WHOSE HIGHEST AND LOWEST MEANS DO NOT DIFFER BY MORE THAN THE SHORTEST SIGNIFICANT RANGE FOR A SUBSET OF THAT SIZE)

SUBSET 1

GROUP	GRP 2	GRP 1	GRP 3
MEAN	.3976	.4118	.7391

SUBSET 2

GROUP	GRP 3	GRP 4
MEAN	.7391	1.3604

FILE NONAME (CREATION DATE = 07/27/83)

- O N E W A Y -

VARIABLE DIFF3
BY IREXP

ANALYSIS OF VARIANCE

SOURCE	D.F.	SUM OF SQUARES	MEAN SQUARES	F RATIO	F PROB.
BETWEEN GROUPS	3	4.8894	1.6631	.698	.3542
WITHIN GROUPS	189	433.9367	2.2960		
TOTAL	192	438.7461			

GROUP	COUNT	MEAN	STANDARD DEVIATION	STANDARD ERROR	MINIMUM	MAXIMUM	95 PCT CONF INT FOR MEAN
GRP 1	68	.8235	1.6476	.1998	-4.0000	4.0000	.4247 TO 1.2223
GRP 2	83	.9518	1.5618	.1713	-3.0000	4.0000	.6110 TO 1.2927
GRP 3	23	1.0870	1.1644	.2428	-1.0000	3.0000	.5835 TO 1.5905
GRP 4	19	1.3684	1.1161	.2560	0	4.0000	.8305 TO 1.9063
TOTAL	193	.9637			-4.0000	4.0000	
	UNGROUPED DATA		1.5117	.1088			.7491 TO 1.1784
	FIXED EFFECTS MODEL		1.5152	.1091			.7486 TO 1.1789
	RANDOM EFFECTS MODEL		.2181	.1891			.6166 TO 1.3108

RANDOM EFFECTS MODEL - ESTIM. OF BETWEEN COMPONENT VARIANCE -.0161

TESTS FOR HOMOGENEITY OF VARIANCES

COCHRANS C = MAX.VARIANCE/SUM(VARIANCES) = .3582, P = .867 (APPROX.)
BARTLETT-BOX F = 2.137, P = .094
MAXIMUM VARIANCE / MINIMUM VARIANCE = 2.179

- -

FILE NONAME (CREATION DATE = 07/27/83)

ONEWAY

VARIABLE DIFF3

MULTIPLE RANGE TEST

DUNCAN PROCEDURE
RANGES FOR THE .050 LEVEL -

2.79 2.94 3.03

THE RANGES ABOVE ARE TABULAR VALUES.
THE VALUE ACTUALLY COMPARED WITH MEAN(J)-MEAN(I) IS..
1.0714 * RANGE * SQRT(1/N(I) + 1/N(J))

HOMOGENEOUS SUBSETS (SUBSETS OF GROUPS, WHOSE HIGHEST AND LOWEST MEANS DO NOT DIFFER BY MORE THAN THE SHORTEST SIGNIFICANT RANGE FOR A SUBSET OF THAT SIZE)

SUBSET 1

GROUP	GRP 1	GRP. 2	GRP 3	GRP 4
MEAN	.8235	.9518	1.0870	1.3684

FILE MDNAME (CREATION DATE = 07/27/83)

- O N E W A Y -

VARIABLE DIFF4
By IREXP

ANALYSIS OF VARIANCE

SOURCE	D.F.	SUM OF SQUARES	MEAN SQUARES	F RATIO	F PROB.
BETWEEN GROUPS	3	16.1717	5.3906	4.522	.0044
WITHIN GROUPS	189	225.3101	1.1921		
TOTAL	192	241.4819			

GROUP	COUNT	MEAN	STANDARD DEVIATION	STANDARD ERROR	MINIMUM	MAXIMUM	95 PCT CONF INT FOR MEAN
GRP 1	68	.9559	1.0571	.1282	-2.0000	4.0000	.7000 TO 1.2118
GRP 2	83	1.0602	1.1407	.1252	-1.0000	4.0000	.8112 TO 1.3093
GRP 3	23	.6522	.7751	.1616	-1.0000	2.0000	.3170 TO .9874
GRP 4	19	1.8421	1.3023	.2988	0	4.0000	1.2144 TO 2.4698
TOTAL	193	1.0518			-2.0000	4.0000	
UNGROUPED DATA			1.1215	.0807			.8926 TO 1.2110
FIXED EFFECTS MODEL			1.0918	.0786			.8968 TO 1.2068
RANDOM EFFECTS MODEL			.3937	.1969			.4253 TO 1.6783

RANDOM EFFECTS MODEL - ESTIM. OF BETWEEN COMPONENT VARIANCE .0978

TESTS FOR HOMOGENEITY OF VARIANCES

COCHRANS C = MAX.VARIANCE/SUM(VARIANCES) = .3597, P = .042 (APPROX.)
BARTLETT-BOX F = 1.936, P = .122
MAXIMUM VARIANCE / MINIMUM VARIANCE = 2.823

- -

FILE NONAME (CREATION DATE = 07/27/83) 34

----------ONEWAY----------

VARIABLE DIFF4

MULTIPLE RANGE TEST

DUNCAN PROCEDURE
RANGES FOR THE .050 LEVEL -

2.79 2.94 3.03

THE RANGES ABOVE ARE TABULAR VALUES.
THE VALUE ACTUALLY COMPARED WITH MEAN(J)-MEAN(I) IS..
.7720 * RANGE * SQRT(1/N(I) + 1/N(J))

HOMOGENEOUS SUBSETS (SUBSETS OF GROUPS, WHOSE HIGHEST AND LOWEST MEANS DO NOT DIFFER BY MORE THAN THE SHORTEST SIGNIFICANT RANGE FOR A SUBSET OF THAT SIZE)

SUBSET 1

GROUP	GRP 3	GRP 1	GRP 2
MEAN	.6522	.9559	1.0402

SUBSET 2

GROUP	GRP 4
MEAN	1.0421

APPENDIX J

AFLMC SURVEY DATA

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100=590 "A" "E3" 30 "A" "C" "D" "C" "C" "D" "D" "B" "E" "D" "C" "D" "D"
110=51 "C" "E3" 20 "A" "A" "E" "E" "A" "E" "A" "C" "E" "E" "E" "D" "E"
120=44 "C" "E5" 72 "A" "B" "E" "C" "B" "D" "C" "C" "D" "E" "D" "E" "D"
130=54 "C" "E3" 36 "A" "B" "D" "C" "A" "C" "E" "C" "E" "D" "D" "D" "D"
140=62 "C" "E5" 60 "A" "A" "C" "D" "A" "D" "D" "D" "D" "E" "C" "D" "C"
150=49 "C" "E3" 18 "A" "B" "E" "D" "A" "C" "E" "C" "D" "E" "D" "E" "D"
160=56 "C" "E3" 30 "A" "A" "E" "B" "B" "A" "D" "B" "C" "E" "E" "E" "D"
170=246 "C" "E6" 180 "A" "B" "E" "C" "F" "B" "F" "B" "F" "D" "D" "D" "E"
180=248 "D" "E6" 192 "A" "A" "E" "B" "F" "A" "F" "B" "F" "E" "B" "E" "E"
190=252 "D" "E7" 264 "A" "A" "E" "F" "F" "C" "F" "C" "F" "B" "D" "D" "E"
200=247 "D" "E4" 36 "A" "C" "D" "B" "D" "D" "D" "C" "B" "D" "E" "D" "D"
210=250 "D" "E5" 84 "A" "C" "E" "C" "D" "C" "F" "B" "F" "D" "B" "D" "C"
220=254 "D" "E6" 180 "A" "C" "D" "C" "D" "C" "D" "C" "F" "D" "D" "F" "D"
230=521 "A" "E3" 24 "A" "A" "D" "B" "E" "B" "E" "A" "D" "D" "B" "D" "D"
240=526 "A" "E5" 108 "A" "C" "D" "C" "B" "D" "E" "B" "D" "B" "C" "B" "C"
250=539 "A" "E5" 80 "A" "A" "E" "A" "E" "A" "E" "A" "E" "E" "D" "E" "E"
260=540 "A" "E5" 60 "A" "B" "E" "B" "E" "A" "E" "C" "E" "E" "D" "E" "E"
270=541 "A" "E4" 24 "A" "B" "D" "B" "D" "B" "D" "C" "D" "C" "C" "D" "B"
280=542 "A" "E7" 168 "A" "A" "E" "B" "D" "A" "E" "B" "E" "E" "D" "E" "D"
290=531 "A" "E3" 24 "A" "C" "C" "C" "D" "C" "D" "B" "E" "D" "C" "C" "C"
300=535 "A" "E3" 24 "A" "B" "D" "D" "D" "D" "D" "C" "B" "D" "D" "B" "C" "B"
310=534 "A" "E2" 24 "A" "B" "D" "C" "D" "C" "E" "D" "D" "D" "C" "D" "C"
320=538 "A" "E3" 12 "A" "C" "D" "D" "D" "C" "D" "C" "E" "D" "C" "D" "C"
330=529 "A" "E5" 84 "A" "B" "E" "A" "D" "C" "E" "C" "E" "D" "D" "D" "D"
340=528 "A" "E3" 36 "A" "C" "D" "C" "D" "B" "E" "D" "D" "D" "E" "D" "D"
350=527 "A" "E4" 60 "A" "D" "D" "D" "D" "D" "E" "D" "D" "B" "B" "B" "B"
360=525 "A" "E4" 12 "A" "A" "E" "B" "E" "A" "C" "A" "D" "E" "D" "E" "B"
370=532 "A" "E2" 12 "A" "C" "D" "C" "D" "D" "D" "D" "E" "C" "D" "D" "E"
380=538 "A" "E3" 15 "A" "B" "D" "C" "C" "A" "D" "B" "D" "E" "D" "D" "D"
390=536 "A" "E3" 24 "A" "A" "D" "C" "C" "B" "E" "D" "D" "D" "D" "D" "D"
400=376 "C" "E3" 36 "A" "C" "E" "E" "F" "E" "F" "C" "F" "D" "D" "D" "E"
410=379 "C" "E3" 12 "A" "C" "D" "D" "F" "D" "F" "D" "F" "F" "D" "D" "D"
420=388 "C" "E5" 60 "A" "D" "E" "B" "F" "D" "F" "D" "F" "D" "C" "B" "D"
430=417 "C" "E4" 36 "A" "A" "D" "C" "F" "C" "F" "D" "F" "D" "D" "D" "D"
440=386 "C" "E3" 16 "A" "B" "D" "C" "F" "C" "F" "A" "F" "E" "D" "E" "E"
450=418 "C" "E3" 12 "A" "C" "D" "C" "F" "C" "F" "C" "F" "F" "F" "C" "F"
460=411 "C" "E3" 24 "A" "D" "D" "C" "F" "D" "F" "D" "F" "D" "D" "B" "D"
470=375 "C" "E5" 228 "A" "D" "E" "C" "F" "D" "F" "D" "F" "E" "E" "E" "E"
480=374 "C" "E3" 12 "A" "A" "E" "B" "F" "B" "F" "C" "F" "E" "D" "D" "D"
490=420 "C" "E3" 24 "A" "D" "E" "E" "F" "D" "F" "C" "F" "B" "E" "B" "A"
500=378 "C" "E3" 12 "A" "C" "E" "F" "F" "D" "F" "D" "F" "E" "D" "C" "C"
510=466 "C" "E3" 12 "A" "C" "C" "D" "F" "D" "F" "D" "F" "C" "C" "D" "C"
520=377 "C" "E5" 72 "A" "B" "E" "C" "F" "C" "F" "C" "F" "E" "D" "E" "E"
530=410 "C" "E4" 36 "A" "B" "D" "B" "F" "C" "F" "A" "C" "E" "C" "E" "D"
540=416 "C" "E3" 18 "A" "B" "E" "B" "F" "C" "F" "B" "F" "D" "C" "D" "E"
550=596 "A" "E4" 48 "A" "C" "D" "C" "D" "B" "B" "C" "D" "C" "B" "D" "D"
560=592 "A" "E5" 240 "A" "A" "E" "A" "D" "C" "F" "A" "D" "D" "D" "D" "B"
570=595 "A" "E3" 18 "A" "B" "E" "A" "B" "B" "E" "A" "B" "D" "C" "B" "B"
580=593 "A" "E3" 19 "A" "B" "C" "B" "F" "C" "F" "A" "D" "D" "D" "D" "C"
590=602 "A" "E2" 8 "A" "C" "D" "B" "D" "B" "E" "D" "D" "E" "D" "D" "D"
600=144 "B" "E5" 96 "A" "C" "E" "C" "E" "D" "D" "D" "E" "E" "E" "D" "D"
610=587 "A" "E4" 36 "A" "B" "E" "C" "D" "A" "E" "B" "E" "E" "C" "D" "D"
620=586 "A" "E3" 18 "A" "E" "E" "B" "C" "D" "D" "C" "D" "D" "D" "E" "D"
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630=681 "A" "E3" 12 "A" "A" "E" "D" "C" "D" "D" "D" "D" "E" "D" "C" "D"
640=598 "A" "E4" 27 "A" "E" "E" "D" "D" "D" "D" "D" "E" "D" "D" "A" "C"
650=597 "A" "E2" 4 "A" "E" "E" "B" "F" "C" "F" "D" "D" "D" "B" "B" "C"
660=594 "A" "E1" 2 "A" "B" "E" "B" "D" "C" "D" "C" "D" "D" "D" "C" "D"
670=251 "C" "E6" 168 "A" "B" "C" "B" "E" "C" "D" "C" "D" "D" "C" "D" "C"
680=390 "C" "E3" 12 "A" "B" "D" "D" "F" "C" "F" "D" "F" "C" "B" "F" "F"
690=394 "C" "E5" 60 "A" "C" "E" "B" "F" "B" "F" "C" "F" "D" "D" "D" "D"
700=397 "C" "E4" 36 "A" "C" "E" "B" "F" "C" "F" "A" "F" "D" "D" "E" "D"
710=391 "C" "E3" 24 "A" "C" "B" "D" "F" "C" "F" "C" "F" "B" "B" "C" "B"
720=414 "C" "E7" 180 "A" "B" "D" "A" "F" "C" "F" "B" "F" "B" "D" "D" "C"
730=398 "C" "E3" 24 "A" "C" "E" "B" "F" "B" "F" "C" "F" "D" "C" "D" "D"
740=400 "C" "E4" 36 "A" "D" "E" "D" "F" "F" "F" "D" "F" "D" "C" "C" "C"
750=399 "C" "E3" 9 "A" "B" "D" "C" "F" "B" "F" "C" "F" "E" "D" "E" "D"
760=395 "C" "E4" 48 "A" "B" "D" "C" "F" "C" "F" "C" "F" "D" "D" "C" "D"
770=415 "C" "E5" 120 "A" "E" "E" "E" "F" "E" "F" "E" "F" "B" "B" "B" "B"
780=559 "C" "E3" 12 "A" "A" "B" "B" "C" "D" "C" "D" "D" "D" "C" "D" "C"
790=396 "C" "E3" 24 "A" "E" "E" "E" "F" "E" "F" "E" "F" "D" "D" "F" "F"
800=286 "B" "E4" 31 "A" "B" "B" "B" "F" "A" "F" "A" "F" "E" "D" "C" "B"
810=239 "B" "E3" 17 "A" "C" "D" "C" "F" "C" "F" "C" "F" "B" "D" "D" "D"
820=169 "B" "E8" 192 "A" "D" "E" "E" "F" "D" "F" "D" "F" "A" "A" "B" "B"
830=223 "B" "E7" 204 "A" "E" "E" "D" "F" "D" "F" "C" "F" "D" "D" "D" "D"
840=225 "B" "E4" 42 "A" "D" "B" "D" "F" "D" "F" "D" "F" "E" "D" "D" "D"
850=236 "B" "E3" 30 "A" "B" "C" "C" "F" "C" "F" "B" "F" "E" "F" "E" "B"
860=224 "B" "E6" 180 "A" "E" "E" "C" "F" "D" "F" "C" "F" "D" "D" "D" "D"
870=232 "B" "E3" 30 "A" "D" "D" "B" "F" "C" "F" "C" "F" "D" "C" "D" "D"
880=185 "B" "CV" 192 "A" "C" "D" "C" "F" "B" "F" "A" "F" "F" "D" "D" "D"
890=182 "B" "E3" 24 "A" "C" "D" "C" "F" "D" "F" "B" "F" "D" "B" "B" "A"
900=183 "B" "CV" 168 "A" "A" "D" "B" "F" "A" "F" "A" "F" "D" "D" "D" "D"
910=181 "B" "E4" 42 "A" "C" "B" "C" "F" "C" "F" "C" "F" "E" "C" "C" "C"
920=186 "B" "E5" 84 "A" "C" "D" "C" "F" "C" "F" "B" "D" "D" "D" "D" "D"
930=215 "B" "E5" 102 "A" "B" "E" "A" "F" "A" "F" "C" "F" "D" "D" "D" "E"
940=214 "B" "CV" 336 "A" "B" "D" "C" "F" "B" "F" "C" "F" "B" "B" "D" "B"
950=213 "B" "CV" 204 "A" "B" "E" "C" "F" "D" "F" "D" "F" "D" "D" "D" "D"
960=217 "B" "E4" 42 "A" "B" "E" "C" "F" "D" "F" "C" "F" "D" "E" "D" "D"
970=218 "B" "E5" 72 "A" "B" "C" "D" "F" "C" "F" "D" "F" "B" "B" "D" "B"
980=216 "B" "CV" 360 "A" "C" "C" "C" "F" "D" "F" "C" "F" "C" "C" "C" "C"
990=234 "B" "E5" 120 "A" "B" "D" "A" "F" "B" "F" "A" "F" "D" "D" "D" "D"
1000=228 "B" "E7" 240 "A" "D" "E" "D" "D" "E" "E" "C" "D" "D" "D" "D" "D"
1010=235 "B" "E5" 96 "A" "D" "E" "C" "F" "E" "F" "E" "F" "E" "E" "A" "E"
1020=231 "B" "E5" 72 "A" "A" "D" "D" "F" "D" "F" "D" "F" "B" "B" "B" "F"
1030=227 "B" "E5" 24 "A" "B" "D" "A" "F" "A" "F" "B" "F" "D" "C" "C" "A"
1040=230 "B" "CV" 192 "A" "B" "C" "A" "F" "D" "F" "B" "F" "E" "D" "E" "E"
1050=237 "B" "E5" 72 "A" "A" "D" "A" "F" "A" "F" "D" "F" "D" "B" "D" "B"
1060=226 "B" "CV" 348 "A" "A" "E" "C" "F" "D" "F" "D" "F" "E" "D" "E" "D"
1070=233 "B" "E4" 48 "A" "C" "B" "C" "F" "D" "F" "D" "F" "E" "D" "E" "D"
1080=168 "B" "E5" 60 "A" "B" "E" "B" "F" "A" "F" "B" "F" "E" "C" "D" "D"
1090=381 "C" "E4" 72 "A" "D" "C" "E" "F" "C" "F" "E" "F" "A" "A" "A" "A"
1100=380 "C" "E5" 71 "A" "E" "B" "E" "F" "C" "F" "E" "F" "B" "B" "A" "A"
1110=461 "C" "E4" 24 "A" "B" "C" "B" "F" "B" "F" "B" "F" "E" "C" "C" "C"
1120=389 "C" "E4" 12 "A" "C" "D" "B" "F" "B" "F" "B" "F" "E" "D" "D" "D"
1130=383 "C" "E6" 180 "A" "C" "D" "C" "F" "C" "F" "B" "F" "D" "D" "D" "D"
1140=382 "C" "E4" 24 "A" "B" "D" "A" "F" "B" "F" "A" "F" "E" "D" "E" "E"
1150=275 "F" "CV" 312 "A" "B" "E" "B" "F" "B" "F" "C" "F" "C" "C" "D" "D"
1160=173 "B" "CV" 372 "A" "C" "D" "D" "F" "B" "F" "C" "F" "B" "B" "B" "B"
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1170=599 "A" "E4" 36 "A" "B" "D" "D" "D" "D" "D" "D" "D" "E" "D" "C" "A"
1180=589 "A" "E5" 48 "A" "D" "D" "B" "C" "B" "C" "A" "C" "D" "C" "D" "C"
1190=269 "F" "E3" 12 "A" "D" "D" "C" "F" "D" "F" "D" "F" "E" "D" "D" "E"
1200=146 "B" "E3" 30 "A" "B" "D" "C" "D" "C" "D" "C" "D" "E" "E" "D" "E"
1210=262 "F" "E5" 108 "A" "C" "E" "D" "F" "D" "F" "D" "F" "D" "C" "C" "C"
1220=210 "C" "E2" 6 "A" "D" "D" "D" "F" "D" "F" "C" "F" "D" "C" "B" "C"
1230=273 "F" "E4" 48 "A" "A" "D" "A" "F" "B" "F" "A" "F" "E" "D" "E" "D"
1240=261 "C" "E4" 36 "A" "C" "C" "D" "F" "D" "F" "B" "F" "B" "B" "B" "B"
1250=481 "C" "E3" 24 "A" "D" "D" "F" "F" "C" "F" "D" "F" "C" "C" "D" "C"
1260=73 "C" "E4" 48 "A" "B" "C" "B" "C" "B" "C" "B" "C" "D" "B" "D" "B"
1270=52 "C" "E3" 12 "A" "C" "E" "E" "A" "E" "D" "A" "A" "B" "B" "B" "B"
1280=513 "A" "E4" 24 "A" "C" "C" "C" "F" "C" "F" "C" "F" "C" "C" "B" "B"
1290=546 "C" "E3" 24 "A" "B" "D" "C" "F" "C" "F" "B" "D" "E" "D" "D" "E"
1300=445 "B" "E3" 18 "A" "A" "E" "B" "F" "C" "F" "A" "F" "B" "B" "E" "C"
1310=444 "B" "E4" 60 "A" "C" "E" "C" "F" "B" "F" "D" "F" "E" "D" "E" "D"
1320=543 "C" "E5" 72 "A" "A" "E" "B" "F" "C" "F" "B" "D" "E" "D" "E" "D"
1330=544 "C" "E3" 12 "A" "B" "D" "C" "D" "B" "D" "C" "D" "E" "D" "E" "E"
1340=557 "C" "E3" 12 "A" "D" "D" "C" "C" "D" "C" "D" "D" "F" "F" "D" "C"
1350=514 "A" "E4" 48 "A" "B" "D" "C" "F" "C" "F" "C" "F" "E" "C" "D" "D"
1360=558 "C" "E3" 30 "A" "D" "D" "C" "D" "D" "E" "D" "D" "D" "B" "B" "D"
1370=560 "C" "E3" 24 "A" "C" "D" "B" "D" "C" "D" "D" "D" "B" "D" "B" "B"
1380=561 "C" "E3" 18 "A" "D" "D" "D" "D" "B" "E" "D" "D" "B" "F" "B" "F"
1390=571 "C" "E5" 84 "A" "C" "D" "D" "A" "C" "E" "D" "B" "C" "D" "B" "C"
1400=569 "C" "E4" 36 "A" "C" "E" "D" "D" "D" "E" "C" "B" "D" "E" "B" "D"
1410=572 "C" "E4" 66 "A" "B" "E" "A" "D" "C" "E" "C" "E" "E" "E" "D" "E"
1420=578 "C" "E3" 18 "A" "B" "E" "A" "A" "D" "D" "D" "D" "D" "D" "D" "E"
1430=567 "C" "E3" 12 "A" "C" "C" "D" "C" "D" "D" "D" "D" "C" "C" "B" "D"
1440=568 "C" "E3" 12 "A" "C" "C" "C" "C" "C" "C" "C" "C" "B" "B" "B" "B"
1450=565 "C" "E5" 4 "A" "F" "E" "F" "C" "F" "D" "F" "C" "F" "D" "F" "D"
1460=566 "C" "E5" 48 "A" "B" "E" "C" "C" "D" "E" "C" "E" "E" "E" "E" "E"
1470=554 "C" "E7" 216 "A" "C" "E" "D" "B" "C" "E" "C" "E" "C" "D" "F" "E"
1480=550 "C" "E3" 12 "A" "C" "D" "B" "D" "B" "E" "D" "E" "D" "A" "D" "E"
1490=553 "C" "E5" 66 "A" "C" "E" "C" "D" "C" "D" "C" "E" "D" "D" "D" "D"
1500=551 "C" "E3" 12 "A" "D" "D" "D" "D" "B" "D" "D" "D" "C" "D" "C" "D"
1510=552 "C" "E3" 36 "A" "C" "D" "C" "D" "B" "C" "C" "D" "E" "D" "D" "D"
1520=508 "A" "E6" 156 "A" "B" "D" "A" "F" "B" "F" "C" "F" "D" "D" "E" "D"
1530=515 "A" "E5" 74 "A" "B" "E" "B" "F" "B" "F" "B" "F" "E" "C" "E" "D"
1540=507 "A" "E5" 120 "A" "B" "D" "B" "F" "F" "F" "C" "F" "D" "D" "D" "D"
1550=510 "A" "E3" 24 "A" "D" "E" "C" "F" "D" "F" "E" "F" "D" "D" "D" "D"
1560=509 "A" "E3" 12 "A" "B" "D" "B" "F" "C" "F" "C" "F" "D" "E" "C" "E"
1570=511 "A" "E3" 21 "A" "A" "C" "B" "F" "C" "F" "C" "F" "D" "C" "D" "D"
1580=512 "A" "E2" 7 "A" "D" "D" "D" "C" "F" "C" "F" "D" "F" "F" "B" "F"
1590=473 "B" "E4" 36 "A" "B" "D" "C" "F" "B" "F" "C" "F" "D" "C" "D" "D"
1600=474 "B" "CV" 288 "A" "A" "E" "B" "F" "B" "F" "B" "F" "E" "E" "E" "E"
1610=456 "B" "E6" 252 "A" "C" "E" "C" "F" "C" "F" "D" "F" "D" "E" "D" "E"
1620=487 "B" "E3" 24 "A" "D" "E" "D" "F" "E" "F" "E" "F" "B" "D" "B" "D"
1630=476 "B" "E3" 24 "A" "B" "E" "C" "F" "C" "F" "D" "F" "D" "D" "D" "D"
1640=448 "B" "E2" 12 "A" "A" "A" "A" "F" "C" "F" "C" "F" "B" "A" "B" "A"
1650=475 "B" "E6" 144 "A" "D" "E" "D" "F" "D" "F" "C" "F" "D" "D" "D" "D"
1660=441 "B" "E3" 24 "A" "C" "D" "C" "F" "B" "F" "C" "F" "D" "C" "D" "B"
1670=425 "B" "E3" 12 "A" "C" "E" "B" "F" "C" "F" "B" "F" "E" "D" "E" "E"
1680=447 "B" "E1" 3 "A" "D" "B" "D" "E" "F" "E" "F" "E" "F" "D" "B" "D"
1690=564 "C" "E5" 72 "A" "A" "E" "B" "D" "B" "E" "C" "C" "D" "D" "D" "D"
1700=545 "C" "E3" 24 "A" "A" "D" "A" "B" "C" "C" "C" "D" "C" "D" "D" "D"
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1710=556 "C" "E5" 84 "A" "D" "D" "D" "C" "C" "C" "D" "D" "D" "B" "B" "B"
1720=178 "B" "E3" 24 "A" "D" "C" "D" "F" "E" "F" "C" "F" "B" "B" "B" "B"
1730=204 "B" "E4" 48 "A" "C" "C" "E" "F" "D" "F" "C" "F" "E" "E" "E" "E"
1740=177 "B" "E3" 36 "A" "B" "C" "B" "F" "B" "F" "B" "F" "A" "D" "C" "D"
1750=202 "B" "E4" 54 "A" "B" "E" "C" "F" "C" "F" "A" "F" "E" "E" "E" "E"
1760=176 "B" "E3" 24 "A" "A" "B" "A" "F" "C" "F" "B" "F" "D" "B" "D" "B"
1770=174 "B" "E4" 36 "A" "A" "C" "C" "F" "C" "F" "A" "F" "D" "C" "D" "D"
1780=175 "B" "E4" 30 "A" "A" "E" "C" "F" "B" "F" "B" "F" "E" "D" "E" "D"
1790=187 "B" "E6" 120 "A" "C" "E" "C" "F" "C" "F" "E" "F" "D" "C" "C" "C"
1800=172 "B" "E3" 24 "A" "A" "C" "A" "F" "C" "F" "C" "F" "E" "C" "E" "C"
1810=179 "B" "E4" 42 "A" "A" "F" "B" "F" "B" "F" "B" "C" "E" "D" "E" "D"
1820=167 "B" "CV" 384 "A" "B" "E" "C" "F" "A" "F" "C" "F" "D" "D" "D" "D"
1830=166 "B" "E3" 18 "A" "D" "E" "C" "F" "D" "F" "D" "F" "D" "D" "D" "B"
1840=211 "B" "CV" 240 "A" "E" "D" "C" "F" "C" "F" "B" "F" "D" "D" "D" "D"
1850=212 "B" "E5" 96 "A" "C" "D" "C" "F" "D" "F" "D" "F" "D" "E" "D" "D"
1860=221 "B" "E6" 156 "A" "B" "D" "C" "F" "C" "F" "C" "D" "D" "E" "D" "E"
1870=195 "B" "E6" 180 "A" "D" "D" "C" "F" "D" "F" "C" "F" "B" "C" "B" "F"
1880=193 "B" "CV" 192 "A" "D" "D" "D" "F" "D" "F" "C" "F" "D" "D" "F" "D"
1890=196 "B" "E6" 384 "A" "C" "D" "D" "F" "D" "F" "C" "F" "B" "C" "D" "D"
1900=210 "B" "E4" 72 "A" "C" "D" "B" "F" "D" "F" "C" "F" "C" "D" "B" "C"
1910=209 "B" "E3" 24 "A" "C" "E" "D" "F" "E" "F" "C" "F" "D" "C" "C" "D"
1920=203 "B" "E5" 84 "A" "C" "D" "A" "F" "A" "F" "B" "F" "E" "F" "E" "F"
1930=201 "B" "E3" 18 "A" "B" "E" "C" "F" "C" "F" "C" "F" "D" "C" "D" "D"
1940=205 "B" "CV" 240 "A" "A" "E" "B" "F" "B" "F" "A" "F" "D" "E" "E" "E"
1950=165 "B" "E5" 48 "B" "B" "D" "D" "F" "D" "F" "C" "F" "D" "C" "B" "B"
1960=230 "B" "E3" 30 "A" "D" "C" "D" "F" "D" "F" "D" "F" "C" "C" "B" "B"
1970=188 "B" "E3" 12 "A" "F" "E" "D" "F" "E" "F" "D" "F" "C" "D" "B" "D"
1980=198 "B" "CV" 168 "A" "C" "C" "B" "F" "D" "F" "C" "F" "B" "B" "C" "B"
1990=178 "B" "E4" 60 "A" "A" "E" "B" "F" "B" "F" "B" "F" "E" "D" "E" "D"
2000=191 "B" "E2" 2 "A" "C" "D" "B" "F" "C" "F" "C" "F" "C" "D" "B" "B"
2010=189 "B" "E3" 48 "A" "C" "D" "D" "F" "D" "F" "C" "F" "E" "B" "C" "C"
2020=208 "B" "E6" 156 "A" "C" "D" "D" "F" "D" "F" "C" "F" "D" "D" "D" "D"
2030=194 "B" "E3" 24 "A" "B" "E" "C" "F" "D" "F" "C" "F" "D" "C" "D" "D"
2040=199 "B" "E3" 30 "A" "A" "E" "A" "F" "B" "F" "C" "F" "E" "E" "E" "E"
2050=200 "B" "E3" 30 "A" "B" "D" "B" "F" "C" "F" "C" "F" "D" "E" "D" "D"
2060=180 "B" "E3" 2 "A" "A" "C" "B" "F" "D" "F" "C" "F" "D" "C" "D" "D"
2070=220 "B" "E3" 24 "A" "D" "D" "D" "F" "C" "F" "D" "F" "D" "F" "D" "D"
2080=484 "B" "E3" 18 "A" "C" "D" "B" "F" "D" "F" "D" "F" "D" "F" "D" "D"
2090=485 "B" "E5" 72 "A" "A" "D" "D" "F" "A" "F" "C" "F" "E" "D" "D" "D"
2100=500 "B" "E4" 36 "A" "A" "E" "D" "F" "B" "F" "A" "F" "D" "D" "B" "D"
2110=497 "B" "E3" 24 "A" "C" "D" "B" "F" "A" "F" "B" "F" "D" "C" "D" "F"
2120=472 "B" "E2" 6 "A" "C" "D" "C" "JF" "D" "F" "B" "F" "F" "D" "C" "C"
2130=486 "B" "E4" 36 "A" "A" "E" "A" "F" "D" "F" "A" "F" "E" "E" "E" "E"
2140=34 "A" "E5" 12 "A" "C" "E" "C" "F" "B" "F" "F" "F" "D" "C" "E" "D"
2150=442 "B" "E3" 2 "A" "B" "E" "C" "F" "C" "F" "B" "F" "D" "D" "D" "E"
2160=499 "B" "E4" 36 "A" "C" "C" "D" "F" "D" "F" "B" "F" "D" "D" "E" "D"
2170=446 "B" "E3" 24 "A" "A" "E" "B" "F" "B" "F" "B" "F" "D" "E" "E" "E"
2180=18 "A" "E3" 8 "A" "B" "E" "B" "F" "B" "F" "A" "F" "E" "D" "D" "D"
2190=16 "A" "E6" 144 "A" "B" "D" "B" "F" "B" "F" "B" "F" "E" "D" "E" "D"
2200=24 "A" "E4" 48 "A" "C" "C" "B" "F" "A" "F" "C" "F" "C" "C" "C" "C"
2210=43 "A" "E5" 60 "A" "B" "D" "C" "F" "C" "F" "B" "F" "E" "D" "D" "D"
2220=41 "A" "E5" 12 "A" "B" "D" "D" "F" "D" "F" "C" "F" "F" "F" "D" "D"
2230=46 "A" "E4" 36 "A" "D" "D" "D" "F" "E" "F" "D" "F" "D" "C" "C" "F"
2240=12 "A" "E4" 48 "A" "F"  "D" "B" "F" "C" "F" "D" "F" "B" "C" "C" "B"
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2250=15 "A" "E5" 90 "A" "B" "E" "C" "F" "D" "F" "C" "F" "E" "D" "E" "E"
2260=11 "A" "E4" 36 "A" "C" "D" "C" "F" "C" "F" "D" "F" "C" "D" "C" "D"
2270=35 "A" "E4" 36 "A" "B" "C" "B" "F" "B" "F" "C" "F" "E" "D" "D" "C"
2280=36 "A" "E5" 120 "A" "C" "C" "C" "F" "C" "F" "B" "F" "D" "B" "D" "D"
2290=37 "A" "E5" 137 "A" "C" "E" "B" "F" "C" "F" "C" "F" "E" "E" "B" "E"
2300=38 "A" "E4" 36 "A" "C" "D" "C" "F" "C" "F" "B" "F" "D" "D" "D" "D"
2310=39 "A" "E3" 24 "A" "B" "E" "C" "F" "A" "F" "B" "F" "E" "E" "E" "E"
2320=23 "A" "E6" 144 "A" "B" "E" "C" "F" "D" "F" "C" "F" "D" "D" "E" "D"
2330=27 "A" "E5" 120 "A" "A" "D" "A" "F" "A" "F" "A" "F" "E" "D" "E" "D"
2340=28 "A" "E6" 156 "A" "A" "D" "B" "F" "A" "F" "C" "F" "C" "B" "D" "B"
2350=29 "A" "E5" 84 "A" "C" "E" "C" "F" "D" "F" "D" "F" "E" "D" "D" "D"
2360=30 "A" "E3" 30 "A" "D" "E" "C" "F" "D" "F" "D" "F" "D" "D" "C" "D"
2370=32 "A" "E5" 144 "A" "E" "E" "D" "F" "E" "F" "D" "F" "B" "B" "B" "B"
2380=31 "A" "E3" 18 "A" "B" "D" "C" "F" "B" "F" "C" "F" "E" "E" "E" "E"
2390=19 "A" "E3" 24 "A" "C" "E" "C" "F" "D" "F" "C" "F" "D" "E" "C" "D"
2400=20 "A" "E2" 2 "A" "D" "E" "F" "F" "F" "F" "C" "F" "D" "D" "C" "C"
2410=17 "A" "E5" 132 "A" "C" "C" "C" "F" "D" "F" "A" "F" "E" "C" "E" "C"
2420=21 "A" "E4" 36 "A" "B" "E" "C" "F" "D" "F" "D" "F" "D" "C" "D" "C"
2430=22 "A" "E2" 6 "A" "B" "E" "B" "F" "C" "F" "A" "F" "D" "E" "D" "E"
2440=26 "A" "E9" 384 "A" "A" "E" "B" "F" "C" "F" "B" "F" "E" "E" "E" "E"
2450=3 "A" "E4" 42 "A" "A" "E" "B" "F" "A" "F" "A" "F" "D" "D" "E" "E"
2460=2 "A" "E5" 114 "A" "A" "E" "A" "F" "A" "F" "C" "F" "E" "D" "E" "E"
2470=207 "B" "E4" 48 "A" "C" "B" "D" "F" "D" "F" "B" "F" "A" "D" "C" "D"
2480=222 "B" "E3" 18 "A" "D" "B" "D" "F" "D" "F" "C" "F" "B" "C" "B" "C"
2490=289 "C" "E6" 240 "A" "A" "E" "B" "E" "B"  "E" "A" "E" "E" "E" "E" "E"
2500=477 "B" "E5" 72 "A" "C" "E" "C" "F" "C" "F" "D" "F" "B" "C" "C" "C"
2510=403 "C" "E4" 60 "A" "C" "E" "D" "F" "D" "F" "C" "F" "D" "D" "E" "E"
2520=53 "C" "E4" 60 "A" "D" "E" "D" "B" "D" "D" "D" "C" "B" "B" "B" "B"
2530=47 "C" "E4" 48 "A" "A" "D" "D" "A" "D" "A" "C" "C" "E" "D" "D" "D"
2540=58 "C" "E4" 60 "A" "C" "E" "E" "A" "D" "D" "D" "D" "B" "D" "B" "D"
2550=198 "B" "E4" 6 "A" "B" "E" "B" "F" "B" "F" "B" "F" "E" "E" "E" "E"
2560=197 "B" "E4" 60 "A" "B" "C" "B" "F" "C" "F" "C" "F" "E" "C" "D" "C"
2570=282 "C" "E5" 156 "A" "C" "E" "C" "C" "C" "C" "C" "D" "B" "D" "B" "B"
2580=287 "D" "E6" 300 "A" "B" "D" "B" "D" "D" "D" "A" "D" "D" "D" "D" "D"
2590=291 "C" "E6" 168 "A" "B" "E" "D" "E" "C" "E" "C" "F" "E" "E" "E" "E"
2600=284 "C" "E5" 96 "A" "A" "D" "A" "C" "A" "C" "F"  "F" "E" "D" "D" "D"
2610=171 "B" "CV" 180 "A" "D" "E" "E" "F" "E" "F" "D" "F" "E" "D" "B" "E"
2620=265 "C" "E3" 12 "A" "C" "C" "A" "A" "B" "A" "D" "D" "C" "A" "D" "C"
2630=264 "C" "E3" 24 "A" "C" "E" "B" "C" "C" "D" "D" "D" "D" "E" "B" "E"
2640=229 "B" "E7" 288 "A" "C" "C" "C" "B" "C" "D" "B" "C" "B" "B" "D" "B"
2650=13 "A" "E4" 72 "A" "C" "C" "D" "F" "C" "F" "C" "F" "E" "B" "E" "D"
2660=14 "A" "E4" 24 "A" "C" "D" "C" "F" "C" "F" "F" "F" "D" "D" "D" "D"
2670=42 "A" "E3" 24 "A" "D" "D" "D" "F" "D" "F" "D" "F" "B" "C" "B" "C"
2680=33 "A" "E4" 36 "A" "C" "B" "C" "F" "C" "F" "D" "F" "D" "C" "D" "C"
2690=25 "A" "E7" 264 "A" "A" "E" "B" "F" "B" "F" "C" "F" "D" "E" "D" "E"
2700=404 "C" "E4" 36 "A" "A" "E" "A" "F" "C" "F" "C" "F" "E" "D" "E" "D"
2710=46  "C" "E3" 18 "A" "A" "E" "E" "B" "D" "A" "C" "E" "E" "D" "D" "E"
2720=4 "A" "E6" 192 "A" "A" "E" "B" "F" "C" "F" "C" "F" "D" "D" "E" "E"
2730=1 "A" "E3" 36 "A" "C" "D" "C" "F" "E" "F" "D" "F" "C" "B" "C" "C"
2740=8 "A" "E3" 24 "A" "B" "E" "A" "F" "A" "F" "A" "F"  "E" "E" "E" "E"
2750=6 "A" "E5" 114 "A" "B" "D" "A" "F" "C" "F" "C" "F" "D" "C" "B" "D"
2760=18 "A" "E4" 66 "A" "C" "D" "B" "F" "B" "F" "C" "F" "D" "C" "D" "C"
2770=7 "A" "E4" 36 "A" "C" "E" "C" "F" "C" "F" "C" "F" "D" "D" "D" "D"
2780=9 "A" "E5" 120 "A" "A" "B" "A" "F" "A" "F" "B" "F" "B" "C" "D" "D"
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2790=302 "A" "E5" 144 "A" "A" "D" "A" "B" "A" "B" "A" "B" "D" "C" "E" "C"
2800=304 "A" "E5" 66 "A" "D" "E" "B" "D" "C" "D" "C" "D" "D" "E" "D" "D"
2810=295 "A" "E4" 48 "A" "C" "D" "B" "C" "C" "C" "C" "C" "D" "B" "C" "B"
2820=342 "A" "E5" 60 "A" "C" "D" "C" "A" "D" "D" "D" "D" "D" "A" "D" "A"
2830=309 "A" "E5" 36 "A" "B" "E" "C" "E" "B" "E" "C" "E" "D" "E" "D" "E"
2840=307 "A" "E3" 36 "A" "A" "E" "C" "C" "C" "D" "D" "D" "E" "D" "D" "E"
2850=299 "A" "E5" 84 "A" "B" "E" "E" "B" "A" "B" "A" "B" "D" "C" "D" "B"
2860=336 "A" "E5" 96 "A" "A" "F" "D" "B" "E" "D" "C" "D" "D" "C" "F" "C"
2870=294 "A" "E3" 30 "A" "C" "E" "B" "D" "C" "D" "C" "D" "D" "D" "C" "D"
2880=335 "A" "E5" 114 "A" "C" "D" "D" "E" "D" "C" "C" "E" "D" "C" "D" "C"
2890=301 "A" "E4" 66 "A" "C" "E" "D" "B" "D" "C" "D" "D" "D" "D" "D" "D"
2900=300 "A" "E5" 108 "A" "A" "E" "A" "C" "C" "C" "D" "D" "E" "D" "E" "D"
2910=328 "A" "E5" 120 "A" "B" "D" "C" "D" "C" "D" "C" "D" "B" "C" "F" "F"
2920=330 "A" "E5" 72 "A" "A" "D" "A" "C" "A" "D" "A" "D" "E" "B" "E" "D"
2930=322 "A" "E5" 96 "A" "C" "D" "B" "D" "B" "E" "D" "D" "D" "C" "D" "D"
2940=331 "A" "E3" 31 "A" "A" "E" "B" "D" "C" "D" "B" "E" "E" "D" "E" "D"
2950=321 "A" "E4" 30 "A" "A" "E" "C" "C" "A" "D" "D" "D" "D" "F" "E" "B"
2960=347 "A" "E5" 48 "A" "C" "C" "D" "B" "D" "B" "C" "D" "B" "B" "B" "B"
2970=358 "A" "E3" 24 "A" "A" "E" "A" "E" "A" "E" "A" "E" "D" "D" "D" "D"
2980=332 "A" "E5" 96 "A" "A" "E" "D" "E" "C" "E" "C" "E" "E" "C" "E" "E"
2990=329 "A" "E4" 48 "A" "A" "E" "B" "D" "A" "E" "C" "D" "E" "D" "E" "D"
3000=324 "A" "E3" 30 "A" "C" "D" "C" "D"  "C" "C" "C" "D" "D" "C" "D" "C"
3010=334 "A" "E3" 24 "A" "C" "D" "B" "E" "D" "E" "C" "E" "E" "B" "D" "B"
3020=298 "A" "E5" 96 "A" "B" "C" "C" "B" "B" "D" "C" "C" "D" "C" "D" "C"
3030=255 "D" "E5" 132 "A" "B" "E" "D" "F" "B" "F" "C" "F" "E" "E" "E" "E"
3040=268 "C" "E4" 42 "A" "D" "E" "C" "D" "C" "C" "C" "D" "D" "E" "B" "D"
3050=45 "C" "E1" 16 "A" "D" "E" "E" "B" "D" "D" "D" "E" "B" "D" "B" "D"
3060=249 "D" "E8" 312 "A" "E" "E" "A" "F" "D" "F" "A" "F" "A" "E" "E" "E"
3070=266 "C" "E4" 48 "A" "A" "C" "A" "A" "A" "B" "C" "C" "D" "A" "D" "F"
3080=267 "C" "E4" 48 "A" "A" "C" "A" "A" "A" "A" "C" "C" "D" "D"  "D" "F"
3090=349 "A" "E4" 36 "A" "C" "C" "C" "C" "C" "C" "C" "D" "D" "B" "C" "C"
3100=296 "A" "E3" 24 "A" "C" "D" "C" "D" "B" "D" "C" "D" "D" "D" "D" "D"
3110=312 "A" "E5" 60 "A" "A" "E" "A" "E" "A" "E" "B" "E" "E" "E" "E" "E"
3120=333 "A" "E5" 72 "A" "B" "D" "B" "C" "B" "E" "B" "E" "E" "D" "E" "D"
3130=357 "A" "E5" 108 "A" "C" "E" "C" "D" "D" "E" "D" "E" "D" "D" "E" "D"
3140=355 "A" "E4" 36 "A" "D" "E" "C" "C" "E" "B" "D" "D" "A" "B" "B" "B"
3150=340 "A" "E5" 60 "A" "C" "D" "C" "C" "C" "C" "B" "C" "E" "D" "D" "C"
3160=341 "A" "E5" 120 "A" "C" "E" "C" "B" "C" "D" "C" "C" "E" "B" "D" "A"
3170=308 "A" "E3" 24 "A" "B" "E" "D" "C" "C" "D" "C" "E" "D" "D" "D" "D"
3180=311 "A" "E4" 42 "A" "B" "C" "D" "D" "B" "D" "D" "D" "E" "B" "D" "C"
3190=343 "A" "E5" 96 "A" "C" "D" "E" "D" "A" "A" "C" "D" "B" "B" "B" "B"
3200=351 "A" "E5" 96 "A" "D" "D" "D" "A" "C" "D" "D" "C" "C" "B" "C" "B"
3210=314 "A" "E5" 96 "A" "D" "D" "C" "D" "C" "D" "D" "D" "A" "E" "D" "E"
3220=306 "A" "E5" 108 "A" "B" "E" "D" "D" "E" "D" "E" "E" "B" "D" "B" "B"
3230=348 "A" "E4" 72 "A" "A" "C" "A" "A" "C" "C" "B" "B" "D" "C" "B" "B"
3240=303 "A" "E3" 24 "A" "B" "D" "B" "E" "A" "E" "C" "D" "E" "D" "E" "D"
3250=305 "A" "E4" 72 "A" "A" "E" "A" "B" "A" "F" "A" "A" "D" "C" "E" "D"
3260=315  "A" "E4" 24 "A" "A" "C" "E" "D" "D" "C" "E" "E" "A" "B" "E" "A"
3270=319 "A" "E3" 24 "A" "B" "E" "C" "D" "A" "D" "B" "D" "E" "D" "D" "E"
3280=353 "A" "E5" 4 "A" "F" "D" "F" "C" "F" "E" "D" "D" "F" "F" "F" "C"
3290=337 "A" "E5" 168 "A" "D" "D" "A" "A" "C" "D" "D" "D" "A" "B" "E" "D"
3300=346 "A" "E5" 72  "A" "B" "D" "C" "D" "C" "D" "C" "E" "D" "C" "D" "D"
3310=356 "A" "E4" 60 "A" "C" "D" "C" "C" "D" "C" "C" "C" "C" "C" "B" "B"
3320=317 "A" "E3" 24 "A" "B" "D" "C" "B" "A" "E" "C" "C" "D" "D" "D" "D"
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3330=352 "A" "E3" 18 "A" "D" "B" "B" "D" "B" "D" "D" "E" "D" "D" "C" "B"
3340=316 "A" "E3" 30 "A" "A" "E" "B" "C" "B" "D" "C" "D" "E" "D" "E" "E"
3350=356 "A" "E3" 36 "A" "C" "E" "F" "C" "C" "C" "B" "B" "D" "C" "D" "C"
3360=339 "A" "E5" 66 "A" "D" "B" "D" "D" "B" "D" "D" "E" "D" "A" "D" "B"
3370=318 "A" "E3" 17 "A" "B" "D" "C" "D" "C" "D" "C" "D" "E" "D" "E" "D"
3380=326 "A" "E3" 24 "A" "A" "D" "B" "D" "A" "E" "C" "D" "D" "D" "E" "D"
3390=354 "A" "E5" 132 "A" "C" "C" "C" "C" "C" "C" "B" "C" "E" "C" "D" "C"
3400=316 "A" "E4" 39 "A" "A" "B" "C" "C" "B" "E" "C" "E" "D" "C" "E" "B"
3410=297 "A" "E5" 168 "A" "C" "D" "B" "D" "B" "D" "C" "D" "D" "B" "D" "B"
3420=344 "A" "E5" 66 "A" "C" "D" "D" "D" "E" "C" "D" "E" "D" "C" "B" "C"
3430=90 "C" "E3" 18 "A" "C" "E" "A" "A" "A" "E" "D" "E" "D" "E" "E" "E"
3440=288 "D" "E6" 180 "A" "C" "D" "C" "D" "C" "D" "C" "B" "D" "D" "D" "D"
3450=283 "D" "E7" 264 "A" "A" "D" "B" "C" "A" "C" "A" "D" "D" "D" "D" "D"
3460=286 "D" "E6" 192 "A" "A" "D" "A" "D" "C" "E" "B" "D" "E" "D" "E" "E"
3470=285 "D" "E6" 168 "A" "C" "D" "B" "D" "B" "D" "D" "D" "C" "C" "B" "B"
3480=293 "D" "E5" 96 "A" "C" "B" "C" "D" "A" "D" "C" "D" "D" "B" "D" "C"
3490=292 "D" "E5" 72 "A" "C" "B" "C" "D" "D" "D" "C" "D" "D" "D" "C" "D"
3500=290 "C" "E7" 276 "A" "A" "E" "A" "E" "A" "E" "A" "F" "E" "E" "E" "E"
3510=482 "B" "E2" 36 "A" "C" "D" "E" "F" "E" "F" "D" "F" "C" "C" "D" "C"
3520=338 "A" "E3" 12 "A" "C" "D" "D" "B" "E" "C" "B" "E" "C" "C" "D" "D"
3530=432 "B" "E6" 180 "A" "B" "E" "B" "F" "C" "F" "B" "F  "E" "F" "E" "D"
3540=430 "B" "CV" 198 "A" "A" "E" "B" "F" "B" "F" "B" "F" "E" "E" "D" "E"
3550=431 "B" "E6" 240 "A" "C" "E" "B" "F" "C" "F" "C" "F" "D" "D" "D" "D"
3560=427 "E" "E5" 102 "A" "B" "E" "B" "F" "B" "F" "C" "F" "E" "D" "D" "D"
3570=366 "A" "E3" 24 "A" "C" "E" "D" "F" "C" "F" "B" "F" "E" "E" "D" "E"
3580=367 "A" "E2" 18 "A" "C" "E" "C" "F" "B" "F" "C" "F" "F" "F" "F" "F"
3590=361 "A" "E5" 108 "A" "B" "B" "C" "F" "C" "F" "C" "F" "A" "C" "E" "B"
3600=363 "A" "E3" 12 "A" "D" "B" "D" "F" "D" "F" "D" "F" "C" "D" "B" "B"
3610=376 "A" "E3" 12 "A" "D" "D" "D" "F" "C" "F" "D" "F" "B" "B" "B" "B"
3620=362 "A" "E5" 132 "A" "B" "E" "B" "F" "C" "F" "B" "F" "D" "D" "D" "D"
3630=372 "A" "E3" 12 "A" "E" "D" "C" "F" "C" "F" "D" "F" "D" "D" "C" "C"
3640=364 "A" "E7" 192 "A" "B" "E" "B" "F" "C" "F" "C" "F" "D" "D" "D" "B"
3650=365 "A" "E3" 18 "A" "C" "B" "B" "F" "D" "F" "B" "F" "B" "D" "B" "A"
3660=368 "A" "E1" 1 "A" "C" "B" "F" "B" "F" "B" "F" "D" "F" "D" "F" "F"
3670=359 "A" "E2" 3 "A" "B" "B" "A" "A" "F" "B" "F" "B" "F" "B" "B" "D"
3680=369 "A" "E3" 12 "A" "B" "D" "D" "F" "B" "F" "B" "F" "B" "D" "D" "D"
3690=371 "A" "E2" 6 "A" "C" "D" "B" "B" "F" "C" "F" "D" "F" "D" "C" "D"
3700=373 "A" "E3" 9 "A" "D" "E" "C" "F" "C" "F" "C" "F" "C" "C" "C" "C"
3710=366 "A" "E6" 204 "A" "B" "E" "D" "F" "B" "F" "B" "F" "D" "C" "D" "C"
3720=55 "C" "E4" 60 "A" "A" "D" "C" "B" "B" "B" "C" "B" "B" "C" "D" "D"
3730=71 "C" "E5" 132 "A" "D" "E" "E" "B" "B" "E" "B" "E" "B" "D" "D" "D"
3740=75 "C" "E3" 24 "A" "C" "C" "D" "B" "C" "B" "E" "C" "D" "B" "B" "B"
3750=85 "C" "E4" 36 "A" "B" "D" "B" "A" "C" "B" "D" "D" "D" "B" "D" "D"
3760=69 "C" "E5" 4 "A" "D" "B" "D" "E" "B" "B" "D" "B" "F" "F" "F" "C"
3770=79 "C" "E3" 12 "A" "D" "D" "C" "A" "C" "B" "D" "C" "D" "A" "B" "B"
3780=81 "C" "E4" 12 "A" "B" "D" "B" "D" "C" "B" "C" "D" "E" "D" "D" "D"
3790=88 "C" "E3" 23 "A" "C" "D" "B" "C" "A" "C" "C" "D" "E" "D" "E" "D"
3800=78 "C" "E4" 42 "A" "B" "D" "C" "A" "B" "D" "B" "E" "E" "D" "D" "D"
3810=84 "C" "E1" 1 "A" "D" "D" "C" "D" "B" "C" "D" "D" "C" "D" "C" "C"
3820=91 "C" "E3" 36 "A" "B" "D" "C" "A" "D" "E" "D" "D" "D" "D" "C" "D"
3830=68 "C" "E4" 48 "A" "B" "D" "A" "A" "B" "B" "C" "C" "D" "D" "D" "D"
3840=89 "C" "E3" 36 "A" "E" "E" "C" "C" "D" "B" "D" "D" "C" "D" "B" "C"
3850=77 "C" "E3" 18 "A" "B" "E" "C" "C" "C" "D" "C" "E" "E" "D" "D" "D"
3860=186 "C" "E4" 48 "A" "B" "B" "A" "A" "A" "A" "D" "C" "E" "E" "B" "C"
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3870=99 "C" "E3" 24 "A" "C" "E" "D" "D" "D" "D" "D" "D" "C" "C" "C" "C"
3880=59 "C" "E4" 36 "A" "B" "E" "B" "D" "C" "C" "C" "D" "B" "C" "C" "C"
3890=105 "C" "E7" 192 "A" "A" "E" "A" "D" "B" "D" "A" "E" "E" "E" "E" "D"
3900=58 "C" "E5" 120 "A" "C" "D" "C" "D" "D" "D" "D" "D" "D" "D" "D" "E"
3910=61 "C" "E3" 24 "A" "B" "E" "B" "E" "C" "D" "B" "D" "E" "D" "E" "D"
3920=96 "C" "E3" 27 "A" "C" "D" "C" "C" "C" "F" "C" "F" "D" "F" "C" "F"
3930=95 "C" "E3" 24 "A" "B" "E" "B" "E" "D" "F" "B" "F" "D" "D" "E" "D"
3940=93 "C" "E3" 12 "A" "C" "D" "C" "D" "D" "D" "D" "D" "D" "D" "C" "C"
3950=92 "C" "E3" 16 "A" "D" "D" "D" "D" "D" "D" "C" "D" "F" "F" "C" "B"
3960=97 "C" "E2" 7 "A" "D" "E" "C" "F" "F" "F" "D" "E" "B" "D" "B" "C"
3970=94 "C" "E3" 12 "A" "D" "E" "D" "D" "B" "D" "B" "D" "B" "D" "B" "D"
3980=60 "C" "E4" 48 "A" "C" "E" "C" "F" "C" "F" "D" "F" "E" "D" "D" "D"
3990=63 "C" "E3" 18 "A" "D" "C" "B" "C" "B" "C" "B" "C" "D" "B" "D" "B"
4000=495 "B" "E4" 42 "A" "B" "C" "C" "F" "C" "F" "B" "F" "D" "C" "D" "D"
4010=436 "B" "E5" 132 "A" "D" "E" "D" "F" "C" "F" "C" "F" "D" "D" "D" "D"
4020=437 "B" "E4" 48 "A" "A" "E" "C" "F" "D" "F" "A" "F" "E" "E" "E" "E"
4030=492 "B" "E4" 24 "A" "B" "E" "D" "F" "D" "F" "D" "F" "E" "D" "E" "D"
4040=489 "B" "E4" 48 "A" "B" "C" "B" "F" "B" "F" "D" "F" "E" "B" "E" "C"
4050=453 "B" "E5" 60 "A" "A" "D" "A" "F" "C" "F" "A" "F" "D" "C" "D" "F"
4060=439 "B" "E3" 32 "A" "C" "E" "D" "F" "C" "F" "B" "F" "E" "C" "C" "C"
4070=426 "B" "CV" 384 "A" "A" "E" "B" "F" "B" "F" "A" "F" "E" "E" "E" "E"
4080=452 "B" "E5" 108 "A" "D" "D" "D" "F" "D" "F" "C" "F" "E" "D" "D" "D"
4090=493 "B" "E4" 60 "A" "B" "E" "B" "F" "B" "F" "B" "F" "E" "D" "D" "D"
4100=494 "B" "E4" 36 "A" "B" "E" "D" "F" "D" "F" "D" "F" "D" "D" "D" "D"
4110=611 "F" "E6" 204 "A" "B" "E" "C" "D" "D" "E" "B" "D" "E" "E" "E" "E"
4120=603 "C" "E3" 12 "A" "D" "E" "D" "D" "D" "D" "C" "E" "D" "D" "D" "E"
4130=604 "F" "E4" 48 "A" "A" "E" "B" "D" "A" "E" "A" "E" "E" "D" "E" "D"
4140=608 "C" "E4" 48 "A" "C" "E" "C" "D" "C" "D" "C" "D" "D" "D" "D" "D"
4150=622 "C" "E4" 60 "A" "C" "E" "C" "E" "C" "E" "C" "E" "D" "E" "D" "B"
4160=621 "C" "E4" 48 "A" "D" "D" "D" "D" "D" "D" "B" "D" "C" "D" "B" "D"
4170=609 "F" "E3" 30 "A" "B" "E" "B" "E" "B" "E" "B" "E" "E" "E" "D" "D"
4180=623 "F" "E3" 12 "A" "D" "E" "D" "D" "D" "D" "D" "E" "C" "D" "C" "D"
4190=620 "F" "E3" 31 "A" "B" "E" "B" "E" "C" "D" "B" "E" "E" "D" "D" "D"
4200=616 "F" "CV" 336 "A" "B" "E" "B" "E" "C" "E" "B" "E" "E" "E" "E" "E"
4210=563 "C" "E4" 42 "A" "B" "D" "A" "C" "E" "E" "D" "D" "E" "D" "E" "C"
4220=446 "B" "E3" 24 "A" "D" "C" "C" "F" "C" "F" "C" "F" "D" "B" "D" "C"
4230= 164 "C" "E3" 12 "A" "B" "D" "C" "C" "D" "D" "C" "D" "D" "E" "E" "E"
4240=478 "B" "E4" 60 "A" "A" "D" "D" "F" "D" "F" "D" "F" "D" "D" "D" "D"
4250=479 "B" "E4" 24 "A" "D" "B" "C" "F" "D" "F" "D" "A" "B" "B" "C" "B"
4260=392 "C" "E6" 168 "A" "A" "E" "A" "F" "A" "F" "A" "F" "E" "E" "E" "E"
4270=498 "B" "E6" 228 "A" "C" "C" "C" "F" "C" "F" "B" "F" "B" "B" "B" "B"
4280=481 "B" "CV" 324 "A" "C" "C" "D" "F" "C" "F" "D" "F" "B" "D" "B" "C"
4290=488 "B" "CV" 144 "A" "C" "D" "D" "F" "D" "F" "A" "F" "C" "A" "C" "C"
4300=591 "A" "E4" 48 "A" "A" "D" "B" "D" "B" "D" "A" "D" "E" "C" "E" "C"
4310=377 "C" "E4" 42 "A" "B" "D" "B" "F" "C" "F" "C" "F" "C" "B" "D" "B"
4320=141 "B" "E2" 60 "A" "B" "C" "A" "D" "C" "D" "C" "F" "E" "B" "E" "B"
4330=112 "B" "E4" 132 "A" "A" "D" "C" "D" "F" "F" "A" "C" "E" "E" "D" "D"
4340=110 "B" "E2" 4 "A" "D" "E" "D" "E" "B" "F" "D" "D" "D" "D" "C" "D"
4350=109 "B" "E4" 36 "A" "D" "C" "B" "F" "C" "F" "C" "F" "B" "B" "C" "B"
4360=142 "B" "E3" 24 "A" "D" "D" "B" "E" "C" "F" "C" "F" "D" "D" "D" "B"
4370=108 "B" "E2" 4 "A" "D" "E" "D" "F" "D" "F" "D" "F" "A" "C" "B" "C"
4380=111 "B" "E5" 72 "A" "A" "E" "C" "D" "F" "F" "A" "C" "D" "D" "E" "B"
4390=139 "B" "E4" 36 "A" "C" "E" "C" "E" "F" "F" "C" "D" "E" "D" "D" "E"
4400=151 "B" "E3" 24 "A" "B" "B" "C" "C" "B" "F"  "B" "F" "D" "F" "D" "D"
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4410=150 "B" "CV" 156 "A" "B" "D" "A" "F" "B" "F" "B" "F" "D" "B" "D" "D"
4420=152 "B" "CV" 156 "A" "B" "E" "B" "F" "A" "F" "A" "F" "D" "D" "D" "D"
4430=149 "B" "E3" 18 "A" "A" "D" "B" "E" "B" "F" "B" "F" "D" "D" "D" "E"
4440=148 "B" "E4" 48 "A" "C" "D" "C" "D" "D" "F" "C" "F" "B" "B" "D" "B"
4450=147 "B" "E3" 8 "A" "C" "C" "C" "C" "B" "C" "B" "C" "D" "B" "C" "C"
4460=145 "B" "CV" 360 "A" "C" "C" "C" "C" "C" "C" "C" "C" "D" "D" "D" "D"
4470=143 "B" "CV" 264 "A" "B" "E" "D" "F" "D" "F" "D" "F" "D" "D" "D" "D"
4480=107 "B" "E3" 24 "A" "C" "E" "C" "E" "B" "F" "C" "F" "D" "D" "D" "D"
4490=469 "B" "E3" 12 "A" "C" "D" "C" "F" "C" "F" "C" "F" "C" "C" "B" "D"
4500=461 "B" "E3" 30 "A" "A" "E" "C" "F" "C" "F" "A" "F" "D" "E" "E" "E"
4510=462 "B" "E3" 36 "A" "D" "D" "D" "F" "D" "F" "D" "F" "D" "A" "D" "A"
4520=471 "B" "E2" 12 "A" "C" "C" "C" "F" "D" "F" "D" "F" "B" "C" "D" "D"
4530=457 "B" "E3" 36 "A" "C" "F" "C" "F" "C" "F" "C" "D" "D" "C" "C" "C"
4540=460 "B" "E5" 66 "A" "B" "D" "C" "F" "F" "F" "C" "F" "D" "D" "D" "D"
4550=488 "B" "E3" 18 "A" "C" "D" "B" "F" "D" "F" "D" "F" "B" "C" "B" "B"
4560=458 "B" "E4" 36 "A" "A" "E" "A" "F" "A" "F" "A" "F" "E" "E" "D" "E"
4570=459 "B" "E3" 36 "A" "B" "E" "D" "F" "E" "F" "C" "F" "E" "D" "B" "D"
4580=496 "B" "E3" 18 "A" "B" "B" "D" "F" "D" "F" "B" "F" "F" "B" "C" "B"
4590=438 "B" "E3" 36 "A" "B" "E" "A" "F" "C" "F" "B" "F" "E" "D" "D" "D"
4600=435 "B" "E6" 120 "A" "B" "A" "C" "F" "C" "F" "C" "F" "B" "C" "B" "B"
4610=429 "B" "CV" 216 "A" "B" "D" "C" "F" "C" "F" "C" "F" "E" "D" "E" "D"
4620=421 "B" "E5" 192 "A" "C" "E" "C" "F" "C" "F" "C" "F" "E" "E" "E" "E"
4630=428 "B" "CV" 96 "A" "C" "D" "B" "F" "C" "F" "C" "F" "D" "D" "D" "D"
4640=533 "A" "E3" 18 "A" "A" "E" "C" "C" "C" "C" "B" "D" "A" "C" "D" "D"
4650=463 "B" "E5" 168 "A" "B" "E" "A" "F" "A" "F" "B" "A" "E" "E" "E" "E"
4660=464 "B" "E4" 35 "A" "C" "E" "C" "F" "C" "F" "C" "F" "D" "E" "C" "D"
4670=468 "B" "E3" 36 "A" "B" "E" "B" "F" "B" "F" "B" "F" "D" "D" "D" "D"
4680=423 "B" "E2" 4 "A" "D" "E" "B" "F" "C" "F" "C" "F" "F" "F" "F" "D"
4690=470 "B" "CV" 96 "A" "A" "D" "B" "F" "C" "F" "C" "F" "D" "F" "D" "C"
4700=466 "B" "CV" 144 "A" "C" "E" "B" "F" "F" "F" "C" "F" "D" "D" "E" "D"
4710=422 "B" "E3" 12 "A" "B" "E" "C" "F" "C" "F" "B" "F" "D" "D" "E" "E"
4720=454 "B" "E4" 48 "A" "D" "C" "D" "F" "C" "F" "C" "F" "D" "A" "F" "B"
4730=491 "B" "E3" 24 "A" "A" "D" "C" "F" "D" "F" "A" "F" "E" "D" "E" "D"
4740=451 "B" "E3" 30 "A" "C" "E" "B" "F" "D" "F" "C" "F" "D" "C" "D" "F"
4750=456 "B" "E3" 24 "A"  "A" "C" "A" "D" "B" "F" "C" "C" "D" "B" "D" "C"
4760=433 "B" "E3" 24 "A" "D" "E" "C" "E" "D" "D" "D" "E" "C" "D" "B" "D"
4770=424 "B" "E5" 72 "A" "A" "E" "B" "D" "B" "D" "A" "B" "E" "F" "E" "D"
4780=467 "B" "E3" 36 "A" "B" "C" "A" "F" "B" "F" "B" "F" "D" "D" "D" "B"
4790=465 "B" "E3" 24 "A" "C" "D" "D" "F" "D" "F" "C" "F" "D" "D" "B" "D"
4800=522 "A" "E6" 216 "A" "A" "E" "B" "E" "B" "D" "A" "D" "E" "D" "D" "D"
4810=523 "A" "E5" 168 "A" "A" "D" "B" "E" "C" "E" "C" "D" "C" "C" "D" "D"
4820=272 "F" "E3" 2 "A" "B" "E" "F" "F" "C" "F" "B" "F" "D" "D" "C" "D"
4830=524 "A" "E3" 24 "A" "D" "E" "C" "D" "D" "D" "D" "E" "D" "B" "B" "B"
4840=123 "B" "E5" 168 "A" "A" "E" "A" "E" "C" "E" "B" "D" "D" "D" "E" "E"
4850=121 "B" "E6" 168 "A" "C" "B" "B" "F" "B" "F" "C" "F" "D" "C" "D" "D"
4860=118 "B" "E8" 336 "A" "A" "E" "A" "E" "B" "F" "F" "F" "D" "D" "D" "D"
4870=140 "B" "E6" 192 "A" "C" "D" "C" "F" "C" "F" "C" "F" "C" "D" "F" "F"
4880=122 "B" "E3" 36 "A" "D" "E" "B" "E" "C" "E" "C" "E" "E" "E" "E" "E"
4890=119 "E" "E7" 336 "A" "A" "D" "D" "F" "D" "F" "D" "F" "D" "B" "D" "F"
4900=126 "B" "E3" 36 "A" "B" "E" "A" "F" "C" "F" "D" "F" "D" "D" "E" "E"
4910=113 "B" "E3" 24 "A" "A" "E" "A" "D" "A" "D" "C" "F" "E" "E" "D" "E"
4920=114 "B" "E3" 42 "A" "B" "E" "A" "D" "A" "D" "A" "F" "D" "D" "E" "D"
4930=116 "B" "E5" 168 "A" "B" "E" "C" "E" "A" "D" "D" "D" "E" "D" "E" "D"
4940=115 "B" "E4" 36 "A" "C" "E" "B" "F" "F" "F" "B" "F" "D" "E" "E" "D"
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4950=117 "B" "E5" 84 "A" "A" "E" "B" "E" "A" "D" "B" "F" "E" "C" "E" "D"
4960=126 "B" "E3" 24 "A" "B" "D" "C" "F" "F" "F" "F" "E" "D" "D" "D"
4970=153 "B" "E4" 42 "A" "A" "E" "B" "F" "B" "F" "B" "F" "D" "D" "D" "D"
4980=166 "B" "E2" 18 "A" "A" "E" "B" "F" "A" "F" "A" "F" "D" "C" "D" "D"
4990=137 "B" "E4" 36 "A" "B" "E" "B" "F" "B" "F" "A" "F" "E" "D" "E" "D"
5000=128 "B" "E3" 30 "A" "A" "E" "F" "F" "A" "F" "A" "F" "E" "E" "E" "E"
5010=154 "B" "E4" 48 "A" "A" "E" "B" "F" "A" "F" "A" "F" "D" "D" "E" "D"
5020=159 "B" "E5" 72 "A" "A" "E" "A" "F" "A" "F" "A" "F" "D" "D" "E" "D"
5030=135 "B" "E5" 48 "A" "A" "D" "A" "F" "A" "F" "B" "F" "E" "E" "E" "E"
5040=155 "B" "E4" 48 "A" "A" "E" "B" "F" "A" "F" "A" "F" "D" "E" "E" "D"
5050=161 "B" "E4" 36 "A" "A" "E" "A" "F" "A" "F" "A" "F" "D" "D" "D" "D"
5060=134 "B" "E4" 24 "A" "A" "E" "A" "F" "B" "F" "A" "F" "E" "E" "E" "E"
5070=156 "B" "E2" 18 "A" "B" "E" "B" "F" "B" "F" "B" "F" "D" "D" "D" "D"
5080=136 "B" "E4" 36 "A" "B" "E" "A" "F" "A" "F" "A" "F" "E" "E" "E" "C"
5090=127 "B" "E3" 30 "A" "A" "E" "A" "F" "A" "F" "A" "F" "E" "D" "E" "E"
5100=158 "B" "E3" 36 "A" "B" "E" "A" "F" "A" "F" "B" "F" "D" "D" "E" "D"
5110=131 "B" "E6" 72 "A" "A" "E" "A" "F" "A" "F" "A" "F" "A" "E" "E" "E"
5120=132 "B" "E3" 24 "A" "A" "E" "A" "F" "A" "F" "A" "F" "E" "E" "E" "E"
5130=157 "B" "E3" 24 "A" "A" "E" "A" "F" "A" "F" "A" "F" "E" "E" "E" "E"
5140=162 "B" "E4" 42 "A" "A" "E" "A" "F" "A" "F" "A" "F" "E" "D" "E" "E"
5150=164 "B" "E3" 24 "A" "B" "E" "A" "F" "A" "F" "B" "F" "D" "D" "E" "D"
5160=133 "B" "E3" 24 "A" "A" "E" "A" "F" "A" "F" "A" "F" "E" "E" "E" "A"
5170=138 "B" "E3" 36 "A" "A" "E" "A" "F" "A" "F" "A" "F" "E" "E" "E" "E"
5180=129 "B" "E3" 24 "A" "A" "E" "A" "F" "A" "F" "A" "F" "E" "E" "E" "E"
5190=502 "B" "E5" 96 "A" "B" "C" "C" "F" "C" "F" "B" "F" "E" "D" "E" "D"
5200=999 "A" "E5" 96 "A" "C" "E" "F" "F" "D" "D" "D" "E" "E" "D" "D" "E"
5210=999 "A" "E3" 34 "A" "C" "D" "D" "D" "C" "D" "D" "D" "E" "D" "D" "D"
5220=999 "A" "E5" 84 "A" "E" "D" "E" "C" "E" "C" "D" "E" "D" "C" "D" "C"
5230=999 "A" "E2" 00 "A" "F" "D" "C" "B" "C" "C" "F" "D" "F" "C" "C" "D"
5240=999 "A" "E4" 12 "A" "B" "D" "A" "F" "B" "F" "C" "F" "B" "D" "D" "D"
5250=999 "A" "E4" 42 "A" "B" "D" "C" "C" "D" "D" "C" "D" "C" "D" "E" "D"
5260=999 "A" "E3" 18 "A" "A" "E" "A" "F" "B" "F" "C" "F" "B" "E" "D" "D"
5270=999 "A" "E3" 18 "A" "C" "E" "B" "D" "A" "D" "B" "E" "D" "C" "D" "D"
5280=999 "A" "E3" 11 "A" "D" "E" "C" "D" "C" "D" "C" "D" "B" "C" "C" "C"
5290=999 "A" "E5" 48 "A" "B" "E" "B" "F" "C" "D" "C" "E" "D" "D" "D" "D"
5300=999 "A" "E3" 36 "A" "C" "A" "C" "A" "C" "C" "C" "C" "D" "B" "B" "A"
5310=999 "A" "E6" 120 "A" "C" "D" "B" "D" "B" "D" "C" "D" "D" "D" "D" "D"
5320=999 "A" "E5" 48 "A" "A" "E" "A" "F" "E" "A" "C" "D" "E" "D" "E" "D"
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APPENDIX K

ACRONYMS

ADTAC	Air Defense Tactical Air Command
AFLMC	Air Force Logistics Management Center
AFRES	Air Force Reserve
ANG	Air National Guard
AS	Aerospace Standard
CID	Commercial Item Description
CONUS	Continental United States
DAR	Defense Acquisition Regulation
DOD	Department of Defense
DTC	Diamond Tool Company
FSC	Federal Stock Class
GSA	General Services Administration
IM	Item Manager
MAC	Military Airlift Command
NSN	National Stock Number
PRAM	Productivity Reliability Availability Maintainability
QDR	Quality Deficiency Report
SAC	Strategic Air Command
TAC	Tactical Air Command
WTP	Warranted Tool Program

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Captain Marilyn A. Miday is a native of Canton, Ohio. She received a Bachelor of Science in Education from Kent State University at Kent, Ohio. In 1976, she enlisted in the Air Force as an avionics communications/navigation specialist. She was commissioned through OTS in July 1979 and completed the Aircraft Maintenance Officer Course at Chanute Air Force Base, Illinois in December 1979. Captain Miday was assigned to K. I. Sawyer Air Force Base as an assistant maintenance supervisor first for the 410th Field Maintenance Squadron, then for the 410th Avionics Maintenance Squadron. Her next assignment will be with the Logistics Analysis Section, Headquarters Strategic Air Command, Offutt Air Force Base, Nebraska.

Mr. James D. Worthy enlisted in the Air Force in 1959 as a helicopter mechanic. After his honorable discharge in 1964, he worked for the Air Force as a civilian aircraft mechanic. In 1971, Mr. Worthy received a Bachelor of Science in Business Administration (Personnel Management) from Central State University, Edmond, Oklahoma. After graduation, he was promoted to a procurement and production specialist in Central Procurement at Oklahoma City Air Logistics Center. In 1975, he stepped up to an assignment with the Air Force Contract Management Center (AFCMC) Detachment 9, Tainan, Taiwan. From there, he was assigned to Korea, where he assisted in the establishment of another aircraft overhaul facility. In April 1980, Mr. Worthy transferred to AFCMC, Detachment 21, Boeing Military Airplane Company, Wichita, Kansas. His next promotion in 1981 brought him to the Lessons Learned Data Bank, AFALD, Wright-Patterson Air Force Base. After his graduation from AFIT, Mr. Worthy returned to Lessons Learned Data Bank at AFALD.